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Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 323)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1989 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

National Aeronautics and Space Administration
Office of Management
Scientific and Technical Information Division
Washington, DC 1989

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 125 reports, articles and other documents announced during April 1989 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1989 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

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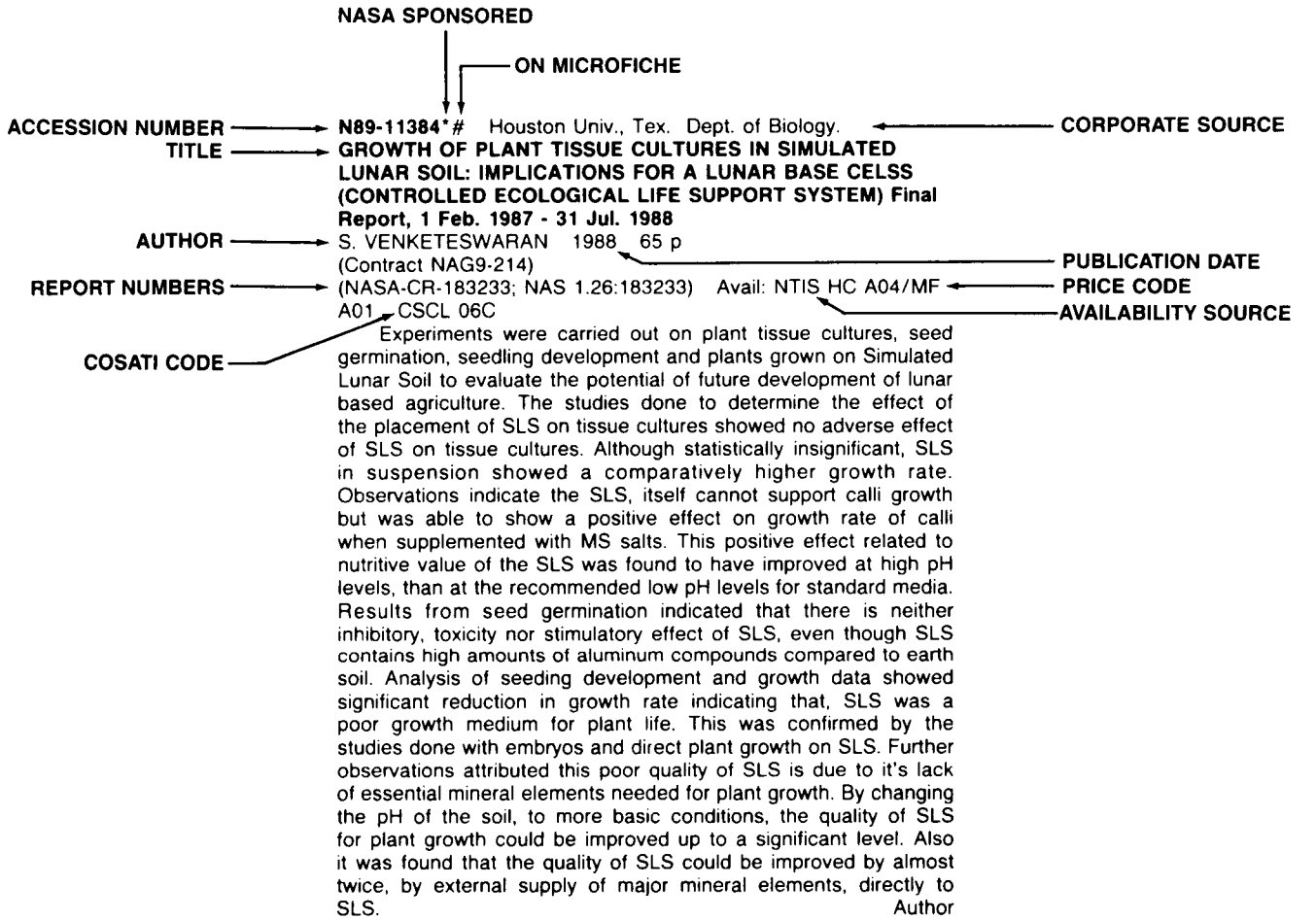
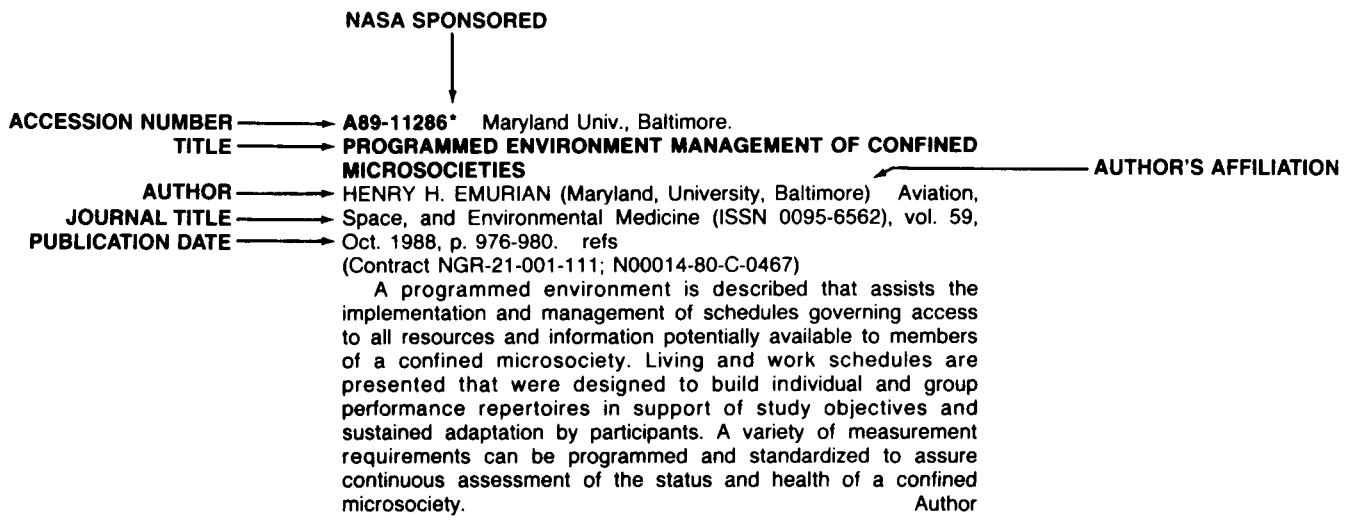
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 323)

MAY 1989

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LIFE SCIENCES (GENERAL)

A89-21640
CHARACTERISTICS OF HEAT EXCHANGE BETWEEN AN ORGANISM AND THE ENVIRONMENT - A STUDY USING A THERMOPHYSICAL MODEL [OSOBENNOSTI TEPLOOBMENA ORGANIZMA SO SREDOI /ISSLEDOVANIE NA TEPLOFIZICHESKOI MODELI/]
G. V. RUMIANTSEV and G. B. MOROZOV (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 74, Sept. 1988, p. 1321-1326. In Russian. refs

A rabbit-body thermal model without heat regulation (consisting of a hollow copper cylinder filled with a water/alcohol mixture) was used to study the characteristics of heat exchange between the rabbit body and the environment. It was found that, after a change of the model's temperature by + or - 0.5 deg was induced by a thermal stimulus of 20-min duration, the model body did not return to the initial level until about 6-8 hours after the return of environment to the original temperature. For a rapid restoration of the model body temperature, a discrete thermal stimulus, equal in magnitude but opposite in direction to the initial stimulus, is necessary. I.S.

A89-22870* Arizona Univ., Tucson.
COEXISTENCE OF TWITCH POTENTIATION AND TETANIC FORCE DECLINE IN RAT HINDLIMB MUSCLE
LUCINDA L. RANKIN, ROGER M. ENOKA, KATHRYN A. VOLZ, and DOUGLAS G. STUART (Arizona, University, Tucson) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Dec. 1988, p. 2687-2695. refs
(Contract NIH-HL-07249; NIH-NS-07309; NIH-NS-20544; NAGW-338)

The effect of whole-muscle fatigue on the isometric twitch was investigated in various hindlimb muscles of anesthetized rats, using an experimental protocol designed to assess the levels of fatigability in motor units. The results of EMG and force measurements revealed the existence of a linear relationship between fatigability and the magnitude of the twitch force following the fatigue test in both soleus and extensor digitorum longus muscles. I.S.

A89-23004* California Univ., San Francisco.
DIRECT AND INDIRECT PATHWAYS TO LAMINA I IN THE MEDULLA OBLONGATA AND SPINAL CORD OF THE CAT
GERT HOLSTEGE (California, University, San Francisco) IN: Progress in Brain Research. Volume 77. Amsterdam, Elsevier Science Publishers, 1988, p. 47-94. refs
(Contract NCC2-491)

The pathways to lamina I in the medulla oblongata and spinal cord of the cat were traced using horse-radish-peroxidase (HRP) and autoradiographic techniques. The HRP results indicated that several neuronal cell groups in the brain stem and hypothalamus project to the spinal cord throughout its total length. The autoradiographic tracing results demonstrated that the strongest projections to lamina I are derived from the following four areas: the caudal nucleus raphe magnus (NRM), the ventral part of the caudal pontine and NRM, the contralaterally projecting lateral pontine or paralemniscal tegmentum, and the paraventricular nucleus of the hypothalamus. In addition, a limited, especially at lumbosacral levels, distinct projection to lamina I was found to originate in the most caudal part of the medullary tegmentum. I.S.

A89-23589
SILICIFIED MICROFOSSILS IN STROMATOLITHIC CHERTS FROM MIDDLE RIPHEAN DEPOSITS IN THE SOUTHERN URALS [OKREMNENNYE MIKROFOSSILII V STRATOTIPE SREDNEGO RIFEIA NA IUZHNOM URALE]
V. N. SERGEEV (AN SSSR, Geologicheskii Institut, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 303, no. 3, 1988, p. 708-710. In Russian. refs

A89-23698
LONG-TERM ANABIOSIS IN SPORULATING BACTERIA WITHIN THE GLACIER IN THE CENTRAL ANTARCTIC [DLITEL'NYI ANABIOZ U SPOROOBRAZUIUSHCHIKH BAKTERII V TOLSHCHE LEDNIKA TSENTRAL'NOI ANTARKTIDY]
S. S. ABYZOV, N. F. KIRILLOVA, and G. V. CHERKESOVA (AN SSSR, Institut Mikrobiologii, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Nov.-Dec. 1988, p. 885-891. In Russian. refs

Data are presented that demonstrate the existence in the bulk of Antarctic glaciers of encased viable microorganisms from other areas of the earth, which are in a state of deep anabiosis. Viable bacterial spores and other microorganisms were aseptically isolated from ice samples obtained at different depths of a glacier from the central Antarctic. The samples were seeded into different growth media, and incubated at 20 C, and the live organisms were identified on the basis of Bergey's Manual (1983). Data on the distribution of different bacterial species in the glacier as a function of the glacier depth (i.e., age) are presented, showing the presence of viable Bacillus subtilis in ice samples aged up to 12,000 years. The findings are discussed in relation to the limits of conservation for the bacterial spores in general. I.S.

A89-23699
9,12,13-TRIHYDROXY 10(E)-OCTADECENIC AND 9,12,13-TRIHYDROXY 10,11-EPOXYOCTADECANOIC ACIDS - NEW ANTISTRESSORS FROM LICORICE [9,12,13-TRIGIDROKSI-10/E/-OKTADETSENOVAIA I 9,12,13-TRIGIDROKSI 10,11-EPOKSIOKTADEKANOVAIA KISLOTY-NOVYE ANTISTRESSORNYE VESHCHESTVA, VYDELENNYE IZ SOLODKI]
E. A. SHIRINIAN, A. G. PANOSIAN, M. L. BARIKIAN, and O. M. AVAKIAN (AN ASSR, Institut Tonkoi Organicheskoi Khimii, Yerevan, Armenian SSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Nov.-Dec. 1988, p. 932-936. In Russian. refs

Six pharmacologically active fractions were isolated from the stem and root sections of the licorice plant (Glycyrrhiza glabra), using preparative thin layer chromatography. These were tested for their relative potency as antistressors in rats and mice, and the two most active fractions were identified by gas chromatography and mass spectrometry techniques to be identical to

9,12,13-trihydroxy derivatives of 10(E)-octadecenic and 10,11-epoxyoctadecanoic acids. In intact stressed rats, both compounds were found to be 400 times more potent than the crude licorice extract. Neither compound exhibited antistressor activity in adrenalectomized rats. I.S.

A89-24369
BEHAVIORAL MEASUREMENT OF LASER FLASHBLINDNESS IN RHESUS MONKEYS
JAMES W. RHODES, PAUL V. GARCIA, and DON J. COSGROVE (Krug International, San Antonio; USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 34-39. refs
(Contract F33615-84-C-0602)

This paper demonstrates that flash-blindness can be measured behaviorally in nonhuman primates. Flash-blindness from Q-switched laser exposures of millisecond-to-microsecond duration was measured in rhesus monkeys performing a visual detection task, using visual stimuli generated by a high-resolution black-and-white television monitor. It was found that the duration of flash blindness was dependent not only on the energy of laser exposures but on the spatial frequency and the contrast of the test stimulus as well. I.S.

A89-24673
CULTIVATION OF SINGLE CELLS IN SPACE
FELIX K. GMUENDER (*Zuerich, Eidgenoessische Technische* Hochschule, Zurich, Switzerland) and A. COGOLI Applied Microgravity Technology (ISSN 0931-9530), vol. 1, July 1988, p. 115-122. Research supported by ESA and Eidgenoessische Technische Hochschule Zuerich. refs
(Contract SNSF-3,338,0,86)

Experiments studying the behavior of single cells in microgravity and the biotechnological aspects of cell cultivation in space are reviewed. Experiments testing the effects of spaceflight on single cells are examined, including studies of bacteria, slime mmolds, algae, plant cells, protozoa, and mammalian cells. Cell culture incubators, bioreactors, and cell cultivation equipment used in space missions are listed and described. In addition, plans for future experiments are considered. R.B.

A89-24750
MENTAL ROTATION OF THE NEURONAL POPULATION VECTOR
APOSTOLOS P. GEORGOPOULOS, JOSEPH T. LURITO, JOE T. MASSEY (Johns Hopkins University, Baltimore, MD), MICHAEL PETRIDES (McGill University, Montreal, Canada), and ANDREW B. SCHWARTZ (Saint Joseph's Hospital and Medical Center, Phoenix, AZ) Science (ISSN 0036-8075), vol. 243, Jan. 13, 1989, p. 234-236. refs
(Contract PHS-NS-17413; PHS-NS-20868)

A rhesus monkey was trained to move its arm in a direction that was perpendicular to and counterclockwise from the direction of a target light that changed in position from trial to trial. Solution of this problem was hypothesized to involve the creation and mental rotation of an imagined movement vector from the direction of the light to the direction of the movement. This hypothesis was tested directly by recording the activity of cells in the motor cortex during performance of the task and computing the neuronal population vector in successive time intervals during the reaction time. The population vector rotated gradually counterclockwise from the direction of the light to the direction of the movement at an average rate of 732 deg per second. These results provide direct, neural evidence for the mental rotation hypothesis and indicate that the neuronal population vector is a useful tool for 'reading out' and identifying cognitive operations of neuronal ensembles. Author

N89-15131# Ruhr Univ., Bochum (Germany, F.R.). Arbeitsgruppe fuer Verletchende Endokrinologie.
INVESTIGATIONS OF THE SURVEY OF THE REPRODUCTIVE BIOLOGY OF XIPHOPHORUS IN AN AQUARACK
VOLKER BLUEM and RUEDIGER SCHULZ *In* ESA, Aquarack: Aim and Possible Research Projects p 17-25 Oct. 1988 Transl. into ENGLISH from Das Aquarack. Rahmendisposition und Moegliche Wissenschaftliche Projekte (Cologne, Fed. Republic of Germany, DFVLR), 1987 p 19-27 Original language document was announced as N88-10471
Avail: NTIS HC A05/MF A01; original German version available from DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 33.50 Deutsche marks

The reproduction biology of the genus Xiphophorus was investigated in the long term maintenance system Aquarack. The availability of a long term maintenance system and a successful reproduction in this system are discussed as prequisites for biological science and for application-oriented research, dealing with boney fish in consecutive generations in a microgravity environment. The particular suitability of the genus Xiphophorus as experimental animal is explained, and the most important endocrine system regulating reproduction is outlined. ESA

N89-15134# Stuttgart Univ. (Germany, F.R.). Inst. fuer Zoologie.
FUNCTIONAL PLASTICITY OF THE NERVOUS SYSTEM OF VERTEBRATES
HINRICH RAHMANN and WOLFGANG PROBST *In* ESA, Aquarack: Aim and Possible Research Projects p 43-55 Oct. 1988 Transl. into ENGLISH from Das Aquarack. Rahmendisposition und Moegliche Wissenschaftliche Projekte (Cologne, Fed. Republic of Germany, DFVLR), 1987 p 47-59 Original language document was announced as N88-10474
Avail: NTIS HC A05/MF A01; original German version available from DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 33.50 Deutsche marks

The development, behavior, and adaptability of the central nervous system (CNS) of fishes, especially the tactum opticum, were investigated using optical and electron microscopes, as well as biochemical methods. Following light versus dark rearing, and adaptation to the cold versus warmth, an ultra structural neuronal plasticity is observed, especially concerning the sites of synapses. Synapses with different activity can be determined by different enrichments of extracellular calcium in the synaptic cleft and by the ultracytochemical observation of the activity of the doubly-ionized-Ca-ion-ATPase in the CNS. Using such ultra structural parameters, the influence of microgravity on the structure and function-related neuronal plasticity of the CNS of vertebrates can be investigated during the early ontogenetic development as well as in the adult state. ESA

N89-15135# Hamburg Univ. (Germany, F.R.). Inst. fuer Zoologie.
THE INFLUENCE OF WEIGHTLESSNESS ON THE METABOLISM IN BIOMPHALARIA GLABRATA
WILHELM BECKER *In* ESA, Aquarack: Aim and Possible Research Projects p 56-65 Oct. 1988 Transl. into ENGLISH from Das Aquarack. Rahmendisposition und Moegliche Wissenschaftliche Projekte (Cologne, Fed. Republic of Germany, DFVLR), 1987 p 61-68 Original language document was announced as N88-10475
Avail: NTIS HC A05/MF A01; original German version available from DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 33.50 Deutsche marks

The influence of weightlessness on behavior, reproduction, and metabolism of the freshwater snail Biomphalaria glabrata (Pulmonata) was investigated. A method for the continuous recording of heartbeat frequency and heart minute volume in the uninjured animal was developed and successfully tested under gravity conditions. The results are planned to be used to determine the effect of the gravitational force on the open circulatory system of this snail. ESA

N89-15136# Bonn Univ. (Germany, F.R.). Inst. fuer Botanie.
THE USEFULNESS OF MICROALGAL STRUCTURES AS AN ELEMENT OF CLOSED ECOLOGICAL SYSTEMS LIKE AQUARACK AND CELSS
KARLHEINZ KREUZBERG *In* ESA, Aquarack: Aim and Possible

Research Projects p 66-74 Oct. 1988 Transl. into ENGLISH from Das Aquarack. Rahmendisposition und Moegliche Wissenschaftliche Projekte (Cologne, Fed. Republic of Germany, DFVLR), 1987 p 69-76 Original language document was announced as N88-10476
Avail: NTIS HC A05/MF A01; original German version available from DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 33.50 Deutsche marks

The usefulness of continuous cultures of green algae, such as Scenedesmus, Chlorella, Chlamydomonas, and Chlorogonium, was examined with respect to the regeneration of oxygen and the reassimilation of CO2 and ammonia. The most important advantages of microalgal cultures are a low demand of space, controlled and selfregulated cell growth, high metabolism rates, efficient energy transfer, a well balanced carbon and nitrogen recovery, and suitability for human food. Further investigations for the development of a practicable algal module for closed ecological systems are proposed. ESA

N89-15500# Oregon State Univ., Corvallis. Dept. of Soil Science.
CTSPAC: MATHEMATICAL MODEL FOR COUPLED TRANSPORT OF WATER, SOLUTES AND HEAT IN THE SOIL-PLANT-ATMOSPHERE CONTINUUM. VOLUME 1: MATHEMATICAL THEORY AND TRANSPORT CONCEPTS
F. T. LINDSTROM, D. E. CAWLFIELD, and L. BOERSMA Jul. 1988 150 p
(Contract EPA-R-814060)
(PB88-238316; EPA-600/3-88-030-VOL-1) Avail: NTIS HC A07/MF A01 CSCL 06C

The mathematical structure of the model consists of the coupling of the model for the transport through soils to a model for transport through plants. The coupled model describes uptake of water and solutes by plants from the soil solution. The rate of uptake is a function of the environmental conditions that determine the transpiration rate. Transport of water, solutes, and heat through the soil is modeled by a two-dimensional approach. The soil is divided into a series of depth increments. Initial root distribution is specified. Water and solutes are taken from each soil layer as determined by soil potential. Water transport in the plant is based on water potential and pressure gradients according to the Munch pressure flow hypothesis. Gradients are determined by water availability in the soil and by atmospheric conditions. Author

N89-15501*# Princeton Univ., NJ. Dept. of Psychology.
IONIC MECHANISMS SUBSERVING MECHANOSENSORY TRANSDUCTION AND NEURAL INTEGRATION IN STATOCYST HAIR CELLS OF HERMISSENDA Final Technical Report, 1 Jul. 1986 - 31 Jun. 1988
JOSEPH FARLEY 21 Nov. 1988 11 p
(Contract NAG2-397)
(NASA-CR-183393; NAS 1.26:183393) Avail: NTIS HC A03/MF A01 CSCL 06C

The neural processing of gravitational-produced sensory stimulation of statocyst hair cells in the nudibranch mollusk Hermissenda was studied. The goal in these studies was to understand how: gravireceptor neurons sense or transduce gravitational forces, gravitational stimulation is integrated so as to produce a graded receptor potential, and ultimately the generation of an action potential, and various neural adaptation phenomena which hair cells exhibit arise. The approach to these problems was primarily electrophysical. Author

N89-15502# Princeton Univ., NJ.
BIOREACTIVITY: STUDIES ON A SIMPLE BRAIN STEM REFLEX IN BEHAVING ANIMALS Annual Report, 1 Jun. 1987 - 31 May 1988
BARRY L. JACOBS 22 Jul. 1988 6 p
(Contract AF-AFOSR-0301-87; AF PROJ. 2312)
(AD-A199404; AFOSR-88-0696TR) Avail: NTIS HC A02/MF A01 CSCL 06D

A major problem in attempting to understand complex physiological processes, such as brain neuromodulation, or complex behavioral processes, such as arousal, is finding a simple system that will permit such analyses. The brain stem masseteric (jaw closure) reflex in cats is such a system. It is simple, containing only one synapse in brain, and receives dense inputs from two neurochemical systems important in neuromodulation and arousal. Initial pharmacologic studies showed that locally applied norepinephrine facilitated the reflex response. More importantly, physiologic conditions, known to activate the brain norepinephrine system, also facilitated the response. This latter finding was shown to be causal, rather than correlative, by a study which found that the facilitation could be blocked by prior destruction of the norepinephrine input specifically to the reflex circuitry. These data represent the first definitive example of an activational effect in an intact and behaving organism being attributable to a particular central neurotransmitter acting at a specific brain site. The masseteric reflex, is not simply a randomly chosen piece of behavior. Jaw closing (or clenching) is a well known response to stress and a component of the anxiety syndrome. Experimental evidence from studies in humans directly demonstrates that the masseteric reflex response is augmented by fear or anxiety. GRA

N89-15503# Naval Aerospace Medical Research Lab., Pensacola, FL.
HIGH PEAK POWER MICROWAVE PULSES AT 1.3 GHZ: EFFECTS ON FIXED INTERVAL AND REACTION TIME PERFORMANCE IN RATS Interim Report, for Period Ending 1987
JOHN A. DANDREA and BRENDA L. COBB Dec. 1987 19 p
(AD-A199489; NAMRL-1337) Avail: NTIS HC A03/MF A01 CSCL 06G

The current safety standards for radiofrequency and microwave exposure do not limit the peak power of microwave pulses for general or occupational exposures. To determine whether high peak power microwave pulses can alter known thresholds of behavioral disruption, four Long-Evans male rats were exposed to peak powers of 496.7, 336.7, and 146.7 kW in a waveguide exposure system while performing a time-related behavioral task. The task consisted of two components: a fixed interval schedule of reinforcement on one response lever and reaction time on a second lever. Responding on each lever was dependent on visual signals displayed through the translucent plastic levers. Trained rats performed the behavioral task during exposure to 1.3-GHz microwave pulses at a pulse repetition rate of 10 Hz. Significant changes occurred in behavioral performance. Session time increased, response rates decreased, and reaction times significantly increased at whole-body SARs of 6.3 and 10.5 W/kg. The alteration of behavior in this study occurred at a whole body SAR between 3.5 and 6.3 W/kg, which is consistent with previous estimates of 4 W/kg as the threshold for behavioral alteration. The high peak power pulses used in this study did not alter this threshold, suggesting that the primary effect must be tissue heating. GRA

N89-15504# Naval Health Research Center, San Diego, CA.
PLATEAU IN MUSCLE BLOOD FLOW DURING PROLONGED EXERCISE IN MINIATURE SWINE Interim Report
M. D. MCKIRNAN, CHARLES G. GRAY, and FRANCIS C. WHITE 25 Aug. 1988 25 p
(AD-A199547; NHRC-88-32) Avail: NTIS HC A03/MF A01 CSCL 06J

Cardiovascular, metabolic and thermoregulatory responses were studied in eight male miniature swine during a prolonged treadmill run. Each animal underwent 8 to 10 weeks of exercise regimen enabled the animals to run at 65 percent of the heart rate range for approximately 100 minutes. Skin wetting and a fan were used to cool the pigs during the run. Regional blood flow was significantly altered with the onset of exercise; however, hindlimb muscle and total gastrointestinal blood flow were unchanged throughout the exercise period. Compared with five minute values, heart rate and cardiac output were significantly elevated. Core temperatures increased between 5 and 30 minutes of exercise but then remained unchanged to the end of exercise.

Mean arterial pressure oxygen consumption and blood lactate did not change during the exercise bout. These data indicate that limiting increases in core temperature during prolonged exercise was associated with a plateau in active muscle blood flow. The cardiovascular drift observed after the plateau in core temperature probably reflected an increased skin blood flow since cooling procedures effectively limited the thermal stress during prolonged exercise. GRA

N89-15505*# Alabama Univ., Huntsville. Consortium for the Space Life Sciences.
ENVIRONMENTAL CONTROL MEDICAL SUPPORT TEAM Final Report
WILLIAM J. CRUMP and MELVIN V. KILGORE, JR. Oct. 1988 430 p
(Contract NAG8-698)
(NASA-CR-184619; NAS 1.26:184619; UAH-RR-742) Avail: NTIS HC A19/MF A01 CSCL 06C

The activities conducted in support of the Environmental Control and Life Support Team during December 7, 1987 through September 30, 1988 are summarized. The majority of the ongoing support has focused on the ECLSS area. Through a series of initial meetings with the ECLSS team and technical literature review, an initial list of critical topics was developed. Subtasks were then identified or additional related tasks received as action items from the ECLSS group meetings. Although most of the efforts focused on providing MSFC personnel with information regarding specific questions and problems related to ECLSS issues, other efforts regarding identifying an ECLSS Medical Support Team and constructing data bases of technical information were also initiated and completed. The specific tasks are as follows: (1) Provide support to the mechanical design and integration of test systems as related to microbiological concerns; (2) Assist with design of Human Subjects Test Protocols; (3) Interpretation and recommendations pertaining to air/water quality requirements; (4) Assist in determining the design specifications required as related to the Technical Demonstration Program; (5) Develop a data base of all microorganisms recovered from previous subsystem testing; (6) Estimates of health risk of individual microbes to test subjects; (7) Assist with setting limits for safety of test subjects; (8) Health monitoring of test subjects; (9) Assist in the preparation of test plans; (10) Assist in the development of a QA/QC program to assure the validity, accuracy and precision of the analyses; and (11) Assist in developing test plans required for future man in the loop testing. Author

N89-15506*# Lockheed Engineering and Sciences Co., Washington, DC.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 20
LYDIA RAZRAN HOOKE, ed., P. LYNN DONALDSON, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, DC.) Washington NASA Dec. 1988 127 p
(Contract NASW-4292)
(NASA-CR-3922(23); NAS 1.26:3922(23)) Avail: NTIS HC A07/MF A01 CSCL 06C

Abstracts of research in the areas of biological rhythms, body fluids, botany, endrocrinology, enzymology, exobiology, genetics, human performance, immunology, life support systems, mathematical modeling, and numerous other topics related to space and life sciences are given. R.J.F.

N89-15507# National Academy of Sciences - National Research Council, Washington, DC. Task Group on Life Sciences.
SPACE SCIENCE IN THE TWENTY-FIRST CENTURY: IMPERATIVES FOR THE DECADES 1995 TO 2015. LIFE SCIENCES
1988 155 p
(LC-87-43334; ISBN-0-309-03880-4) Avail: NTIS HC A08/MF A01

The status and goals of the five areas of research (exobiology, global biology, controlled ecological life support systems, space biology, and space medicine) are discussed. Also discussed are the instrumentation and technologies required to achieve these goals. Author

N89-16249# Virginia Univ., Charlottesville.
PROCEEDINGS OF THE FIRST MEETING OF THE SOCIETY FOR RESEARCH ON BIOLOGICAL RHYTHMS, CHARLESTON, SOUTH CAROLINA Final Report, 1 May - 10 Aug. 1988
FRED W. TUREK 10 Aug. 1988 96 p Proceedings held in Charleston, SC, 11-14 May 1988
(Contract AF-AFOSR-0133-88; AF PROJ. 2312)
(AD-A200134; AFOSR-88-1005TR) Avail: NTIS HC A05/MF A01 CSCL 06D

Partial contents of the conference report on biorhythms are as follows: Organization of Animal Circadian Systems; Pulsatile Rhythms of Neuroendocrine Function; Neural Transplants and Restoration of Circadian Function; Stabilization of Periodic Processes Through Coupling of Oscillators; Photic Effects on Pacemakers; Pineal and Retinal Oscillators In Vitro; Computerized Data Acquisition; Involvement of Protein Synthesis in Circadian Rhythm Generation; Mechanisms of Vertebrate Pacemakers; Photoperiodism and Seasonal Rhythms; Human Rhythms and Sleep; Pharmacological Manipulation of Rhythms; Cellular, Molecular and Genetic Dissection of Clocks; Interaction Between Sleep and the Circadian System; Entraining Effects of Melatonin; Use of Periodogram Analysis and Related Procedures in Biological Rhythms Studies; Use of In Vitro Brain Slices in Studies of Circadian Function; Modulation and Control of Neural Oscillators; Chronobiology of Depression; Cellular and Molecular Basis of Rhythmicity; and Comparative Analysis of Rhythms. GRA

N89-16250# Naval Aerospace Medical Research Lab., Pensacola, FL.
BIBLIOGRAPHY OF SCIENTIFIC PUBLICATIONS 1981-1987 Interim Report, 1 Jan. 1981 - 31 Dec. 1987
KATHLEEN S. MAYER Jul. 1988 24 p
(AD-A200393) Avail: NTIS HC A03/MF A01 CSCL 05B

This report lists citations of all unclassified research reports, special reports, monographs, journal articles, and proceedings that were published by the Naval Aerospace Medial Research Laboratory during calendar years 1981 through 1987. G-tolerance, Aviation selection, Operant behavior, Retention, Selection, Psychological tests. (sdw) GRA

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A89-21551
THE PROBLEMS OF MORBIDITY AND THE MEDICAL DISQUALIFICATION OF FLIGHT PERSONNEL [VOPROSY ZABOLEVAEMOSTI I MEDITSINSKOI DISKVALIFIKATSII LETNOGO SOSTAVA]
V. D. VLASOV and E. M. PANOVA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1988, p. 44-46. In Russian. refs

U.S. data on the morbidity of military personnel are reviewed, with special attention given to the causes of the medical disqualification of military flight personnel. Attention is given to the high incidence of 'hidden' coronary atherosclerosis in U.S military pilots killed in aircraft accidents, and of increasing instances of osteochondrosis and spondylosis with flight time in veteran pilots. Special consideration is given to the causes responsible for the loss of consciousness in pilots and to programs developed to prevent the medical disqualification of U.S. military flight personnel. I.S.

A89-21834
ECHOCARDIOGRAPHIC STUDIES OF THE HEART UNDER CONDITIONS OF ACUTE HYPOXIA [BADANIA ECHOKARDIOGRAFICZNE SERCA W OSTRYM NIEDOTLENIENIU WYSOKOSCIOWYM]
LUCJAN GOLEC and ANDRZEJ SUMINSKI (Woiskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 67-78. In Polish. refs

Of all the systemic compensation reactions to hypoxia, the circulatory system plays a significant role. The degree and efficiency of compensation reactions can be evaluated by studying the systolic dynamics of the left ventricle. It is shown that the hemodynamic compensation for acute hypoxia is expressed by heart rate acceleration and an increase in the left ventricular contractibility. K.K.

A89-21835
THE EFFECT OF TRAINING IN DIFFERENT THERMAL CONDITIONS ON WATER-ELECTROLYTE CHANGES [WPLYW TRENINGU W ROZNICOWANYCH WARUNKACH TERMICZNYCH NA ZMIANY WODNO-ELEKTROLITOWE]
KRZYSZTOF BOMBICKI (Poznan, Akademia Medyczna, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 79-87. In Polish. refs

Three groups of adult white rats were trained at temperatures of 20, 40, and 5 C. The Cort method was used to determine potassium and sodium abundances in the serum and muscular tissue. Maximum dehydration of the muscle tissue took place after 20 and 30 days of training. K.K.

A89-22174
FLUID ELECTROLYTE AND HORMONAL CHANGES IN CONDITIONED AND UNCONDITIONED MEN UNDER HYPOKINESIA
Y. G. ZORBAS, Y. F. FEDERENKO, and K. A. NAEXU (Academia de Stiinte Medicale, Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania) Acta Astronautica (ISSN 0094-5765), vol. 17, Oct. 1988, p. 1123-1126. refs

Pursuant to the suggestion that hypokinesia may induce more changes in fluid electrolyte metabolism and hormonal concentration of blood plasma in conditioned than in unconditioned men, the effect of hypokinesis on fluid-electrolyte excretion and blood hormonal content was studied for 7 days in a group of healthy 19-23 year-old men that were divided into two equal groups according to their physical conditioning. Hypokinesia is found to have induced substantial fluid-electrolyte excretion and blood plasma hormonal content changes in both groups. O.C.

A89-22869
ON THE MODELING AND INTERPRETATION OF OXYGEN UPTAKE KINETICS FROM RAMP WORK RATE TESTS
GEORGE D. SWANSON (Colorado, University, Denver) and RICHARD L. HUGHSON (Waterloo, University, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Dec. 1988, p. 2453-2458. Research supported by NSERC and University of Colorado. refs

Data on the oxygen uptake measured during exercise stress tests on healthy subjects were used for the purpose of modeling the oxygen-uptake step response, and the model was compared with the kinetics of the ramp response data obtained using three ramp slopes. It was found that the ramp data model parameters were highly dependent on the ramp slope and that the model parameters used to characterize ramp data were not consistent with those used to characterize oxygen consumption step data. It is concluded that a linear dynamic system used to interpret the ramp data model was not appropriate, suggesting that ramp exercise testing is not suitable for assessing dynamic control properties of the cardiorespiratory response to exercise, a nonlinear or higher-order function would be more appropriate. I.S.

A89-24364
TRANSDERMAL SCOPOLAMINE - A REVIEW OF ITS EFFECTS UPON MOTION SICKNESS, PSYCHOLOGICAL PERFORMANCE, AND PHYSIOLOGICAL FUNCTIONING
A. C. PARROTT (North East London Polytechnic, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 1-9. refs

This paper reviews literature data on the efficacy of transdermal scopolamine as a prophylactic motion-sickness drug and on its effects on the autonomic and central nervous systems. It is shown that, while scopolamine is the most effective single drug for the prophylaxis and treatment of motion sickness, both oral and transdermal intakes produce deleterious side effects on the cholinergic activities of both the autonomic and the central nervous systems. The autonomic nervous system effects include reduced salivation, bradycardia, and blurred vision, with visual problems increasing upon repeated patch applications. The central nervous system effects include reduced memory for new information, impaired attention, and lowered alertness. I.S.

A89-24365
SIMULATOR SICKNESS IN U.S. FLIGHT SIMULATORS
R. S. KENNEDY, K. S. BERBAUM, D. R. BALTZLEY (Essex Corp., Orlando, FL), M. G. LILIENTHAL (U.S. Navy, Naval Training Systems Center, Orlando, FL), and M. E. MCCAULEY (Monterey Technologies, Inc., Carmel, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 10-16. refs
(Contract N61339-86-D-0026; N61339-81-C-0105)

This paper reports incidence data on flight-simulator-induced motion sickness, obtained from the U.S. Navy's surveys of ten flight simulators at six different Naval/Marine Corps Air Stations, where about 1200 simulator flights were recorded. Some simulators were found to induce severe motion sickness, and some induced unsteadiness afterwards. The simulators which exhibited the highest incidences of sickness were helicopter simulators which use six-degrees-of-freedom moving-base systems and employ multiwindow CRTs to provide a wide field of view in visual displays. Among the displays studied, fixed-wing fixed-base dome displays had relatively low incidence of simulator sickness. I.S.

A89-24366
ADAPTATION TO REPEATED PRESYNCOPAL LOWER BODY NEGATIVE PRESSURE EXPOSURES
J. TIMOTHY LIGHTFOOT (Johns Hopkins University, Baltimore, MD), SUZETTE FEBLES, and SUZANNE M. FORTNEY (Tennessee, University, Knoxville; Johns Hopkins University, Baltimore, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 17-22. refs
(Contract NIH-HL-07534; NIH-HL-10342)

The effect of daily exposures (i.e., training) to presyncopal limited (PSL)-LBNP on the adaptation and tolerance of the human body to simulated hypovolemic challenges was investigated using six subjects. It was found that, by the fifth PSL-LBNP exposure, the tolerance to LBNP was increased over that of day one in all subjects by about 47 percent, with no significant further improvement seen upon further exposures. Maximum heart rates were increased significantly over day one after the third daily exposure. Rate-pressure product was significantly increased on days seven and eight. The possible mechanisms for the occurrence of adaptation to a simulated hypovolemic stress are discussed. I.S.

A89-24367
MONITORING FLUID SHIFTS IN HUMANS - APPLICATION OF A NEW METHOD
H. HINGHOFER-SZALKAY, G. HAAS, T. KENNER (Graz, Universitaet, Austria), and H. OSER (ESA, Microgravity Office, Paris, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 23-28. Research supported by the Oesterreichische Akademie der Wissenschaften. refs

The applicability of the mechanical oscillation technique (MOT) of Kratky et al. (1966) to the measurement of fluid shifts in humans

due to changes in posture was investigated in subjects undergoing tilt-table tests. The MOT was used to monitor changes in the mass density of antecubital venous blood and plasma. It was found that all measured variables (blood density, plasma density, hemoglobin concentrations, and hematocrit) were linearly correlated with each other in single experiments, and that the data on blood density were monitoring accurately the individual time-course of spontaneous and postural capillary fluid shifts. It is shown that blood density, as measured by MOT, can be used for direct hemoglobin calculation. I.S.

A89-24368
HEAT EXCHANGE THROUGH CUTANEOUS VASODILATION AFTER ATROPINE TREATMENT IN A COOL ENVIRONMENT
MARGARET A. KOLKA and LOU A. STEPHENSON (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 29-33. refs

The thermoregulatory effect of an intramuscular injection of atropine sulfate (2 mg) was investigated in humam subjects performing a cycle of seated exercise at an ambient temperature of 22 C. Compared with placebo-injected subjects, atropine-treated subjects displayed a decrease in whole-body and local-area sweating rates. After 10-15 min of exercise, dry heat loss was significantly elevated from the head, chest, back, arm, forearm, and thigh of the atropine-treated subjects, and the core temperature decreased by 0.2 C. The results indicate that the peripheral modification of cutaneous blood flow which occurs in atropine-treated subjects is sufficient to markedly alter the level of heat exchange in a cool environment. I.S.

A89-24371
VASODEPRESSOR SYNCOPE INDUCED BY LOWER BODY NEGATIVE PRESSURE: POSSIBLE RELEVANCE TO +GZ-STRESS TRAINING - A CASE REPORT
FREDERICK HILTON, JAMES GIORDANO, and SUZANNE FORTNEY (Johns Hopkins University, Baltimore, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 61-63. refs

This paper presents a case report of vasodepressor syncope with brief sinus pause in a 26-year-old male subject following a graded lower body negative pressure (LBNP) challenge culminating at -70mm Hg. Cessation of the LBNP protocol resulted in the return of heart rate and blood pressure activity to prechallenge levels. Sinus arrest during central hypovolemic stress has been noted in the literature. Its potential in rare cases during exposures to high levels of LBNP should be noted, as increasing numbers of investigators utilize presyncopal LBNP testing to assess the orthostatic responses of pilots and astronauts. Author

A89-24373
ALTERNOBARIC VERTIGO - AN AEROMEDICAL REVIEW
ROLAND E. WICKS (USAF, Regional Hospital, Eglin AFB, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 67-72. refs

In this article a review of literature and clinical review of alternobaric vertigo is presented. The population of patients discharged from the USAF School of Aerospace Medicine with a diagnosis of alternobaric vertigo from January 1, 1970 to December 31, 1986 is described. The common characteristics of the seven cases are presented. Recommendations and considerations for the future are discussed. Author

A89-24632
SHEAR STRESS EFFECTS ON HUMAN T CELL FUNCTION
K. K. CHITTUR (Battelle Columbus Laboratories, OH), L. V. MCINTIRE (Rice University, Houston, TX), and R. R. RICH (Baylor University, Houston, TX) Biotechnology Progress (ISSN 8756-7938), vol. 4, June 1988, p. 88-95. Research supported by the Robert A. Welch Foundation. refs
(Contract NIH-HL-17437; NIH-AI-21289)

The effect of shear stresses on human T lymphocyte functions is studied using a modified Couette viscometer. Cel suspensions containing T cells, B cells, and monocytes were subjected to uniform shear stresses of 100 and 200 dynes/sq cm for 10 minutes. After stress exposure, the T cell response to the lectin phytohemagglutinin-P was found to be a strong function of the total cell concentration in the culture. It is found that controlled exposure to sublytic shear stresses leads to alterations that can affect the proliferative response of the T cell population, and that these alterations are cell-density dependent. K.K.

N89-15508*# George Washington Univ., Washington, DC. Science Communication Studies.
SPACE MEDICINE RESEARCH PUBLICATIONS: 1984-1986
JANICE S. WALLACE Washington, DC Oct. 1988 120 p
(Contract NASW-4324)
(NASA-CR-4184; NAS 1.26:4184) Avail: NTIS HC A06/MF A01 CSCL 06E

A list is given of the publications of investigators supported by the Biomedical Research and Clinical Medicine Programs of the Space Medicine and Biology Branch, Life Sciences Division, Office of Space Science and Applications. It includes publications entered into the Life Sciences Bibliographic Database by the George Washington University as of December 31, 1986. Publications are organized into the following subject areas: Clinical Medicine, Space Human Factors, Musculoskeletal, Radiation and Environmental Health, Regulatory Physiology, Neuroscience, and Cardiopulmonary. Author

N89-15509# Harvard Univ., Cambridge, MA.
CONTEXT EFFECTS IN RECOGNIZING SYLLABLE-FINAL Z AND S IN DIFFERENT PHRASAL POSITIONS Annual Report No. 1, 15 Jun. 1987 - 15 Jun. 1988
PETER C. GORDON 6 Sep. 1988 37 p
(Contract AF-AFOSR-0305-87; AF PROJ. 2313)
(AD-A199923; AFOSR-88-0936TR) Avail: NTIS HC A03/MF A01 CSCL 05H

Two experiments are reported that use gating methods to examine the role of non-semantic aspects of sentential context in the recognition of phonetic segments. Performance in recognizing syllable-final s and z improves when the syllables are presented to listeners in sentential context as compared to when they are presented in isolation. It appears that listeners are able to use sentential information in order to factor out prosodically based variations in the temporal characteristics of speech in order to more accurately interpret durational cues to segment identity. These findings extend previous results on rate-dependent processing of overall speaking rate to the processing of local speaking rate, and they provide further demonstration of the importance of extended phonetic context in speech recognition. GRA

N89-15510# Air Force Systems Command, Wright-Patterson AFB, OH. Foreign Technology Div.
PEOPLE'S REPUBLIC OF CHINA NATIONAL STANDARD LASER RADIATION OCCUPATIONAL HEALTH STANDARD
5 Oct. 1988 29 p Transl. into ENGLISH of Laser Radiation Occupational Health Standard (People's Republic of China), 1985 6 p
(AD-A199948; FTD-ID(RS)T-0603-88) Avail: NTIS HC A03/MF A01 CSCL 09C

As far as the long term exposure to laser radiation of a certain strength by laser workers is concerned, it is possible for it to give rise to reductions in visual acuity, clouding of lenses, as well as headaches, anemia, nerve weakness, and other similar bad effects throughout the entire body. The potentially problem causing laser radiations are capable of leading to severe acute disorders. Because of this, personnel in contact with lasers (exclusive of those receiving laser diagnosis and treatment) should receiver strengths of radiation which are definitely limited. The wavelengths of laser radiation are from 200 m to 1 mm. The maximum permissible amounts of radiation (or degree of radiation) are not only related to wavelength, but also, have a close relationship with the duration of the radiation received. GRA

N89-15511# Dayton Univ., OH.
MODELING EYE MOVEMENT SEQUENCES USING CONCEPTUAL CLUSTERING TECHNIQUES Final Report, Oct. 1985 - Dec. 1987
MICHAEL S. BELOFSKY and DON R. LYON Aug. 1988 16 p
(Contract F33615-84-C-0066; F33615-87-C-0012)
(AD-A199403; AFHRL-TR-88-16) Avail: NTIS HC A03/MF A01 CSCL 12I

An algorithm for clustering noisy continuous numeric data was developed in a learning system called 2DCG (two dimensional cluster generalization). The 2DCG system operates in a two-dimensional space, but a general system could operate in an N-dimensional space. The objective of the system was to learn a set of rules which modeled human observers (in the application presented here, this model predicted changes in the eye position of human observers during a visual monitoring task). The rule set had to be complete, consistent, and nonredundant, while minimizing the number and maximizing the generality of the rules. The development of this model and its performance in accounting for noisy data are described. GRA

N89-15512# Naval Aerospace Medical Research Lab., Pensacola, FL.
THE DEVELOPMENT OF PERFORMANCE-BASED AUDITORY AVIATION CLASSIFICATION STANDARDS IN THE US NAVY
GERALD B. THOMAS, CARL E. WILLIAMS, and JILL F. RANEY Dec. 1987 31 p
(AD-A199488; NAMRL-1335) Avail: NTIS HC A03/MF A01 CSCL 06D

A series of studies was undertaken to develop a performance-based test battery to ascertain the auditory fitness of naval aviators. On the basis of literature reviews, interviews with experienced pilots, and published job analyses, several auditory abilities were identified. These included perception of degraded speech, response time to auditory signals, auditory short-term memory, and auditory selective attention. Tests to measure these abilities were developed and evaluated in terms of sensitivity and test-retest reliability (Experiments 1 and 2; total N = 105). Sensitivity was sufficient to readily discriminate between pilots of disparate age groups, and test-retest reliabilities ranged from .71 to .88 for individual test battery elements. Experiment 3 sought to increase the validity of the test battery by incorporating major elements into a tape-recorded flight scenario. GRA

N89-15513*# Good Samaritan Hospital and Medical Center, Portland, OR. Dept. of Neuro-otology.
ROLE OF ORIENTATION REFERENCE SELECTION IN MOTION SICKNESS Semiannual Status Report
ROBERT J. PETERKA and F. OWEN BLACK Dec. 1988 82 p
(Contract NAG9-117)
(NASA-CR-184609; NAS 1.26:184609) Avail: NTIS HC A05/MF A01 CSCL 06E

Previous experiments with moving platform posturography have shown that different people have varying abilities to resolve conflicts among vestibular, visual, and proprioceptive sensory signals used to control upright posture. In particular, there is one class of subjects with a vestibular disorder known as benign paroxysmal positional vertigo (BPPV) who often are particularly sensitive to inaccurate visual information. That is, they will use visual sensory information for the control of their posture even when that visual information is inaccurate and is in conflict with accurate proprioceptive and vestibular sensory signals. BPPV has been associated with disorders of both posterior semicircular canal function and possibly otolith function. The present proposal hopes to take advantage of the similarities between the space motion sickness problem and the sensory orientation reference selection problems associated with the BPPV syndrome. These similarities include both etiology related to abnormal vertical canal-otolith function, and motion sickness initiating events provoked by pitch and roll head movements. The objectives of this proposal are to explore and quantify the orientation reference selection abilities of subjects and the relation of this selection to motion sickness in humans. Author

N89-15514# Oak Ridge National Lab., TN. Biology Div.
RADIATION PROTECTION GUIDELINES FOR SPACE MISSIONS
R. J. M. FRY 1987 16 p Presented at the NATO Advanced Study Institute on Terrestrial Space Radiation and Its Biological Effects, Corfu, Greece, 12 Oct. 1987
(Contract DE-AC05-84OR-21400)
(DE88-006181; CONF-8710285-1) Avail: NTIS HC A03/MF A01

The original recommendations for radiation protection guidelines were made by the National Academy of Sciences in 1970. Since that time the U.S. crews have become more diverse in their makeup and much has been learned about both radiation-induced cancer and other late effects. While far from adequate there is now some understanding of the risks that high-Z and -energy (HZE) particles pose. For these reasons it was time to reconsider the radiation protection guidelines for space workers. This task was undertaken recently by National Council on Radiation Protection (NCRP). DOE

N89-15515# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (Germany, F.R.). Abteilung Weltraumbiologie.
COMPARATIVE INVESTIGATIONS CONCERNING GRAVITAXIS AND MORPHOLOGY OF LOXODES AND PARAMECIUM Thesis - Bonn Univ.
RUTH HEMMERSBACH-KRAUSE Aug. 1988 159 p In GERMAN; ENGLISH summary
(DFVLR-FB-88-27; ISSN-0171-1342; ETN-89-93657) Avail: NTIS HC A08/MF A01; original German version available from DFVLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, 55 Deutsche marks

The behavior of free-swimming animal cells was observed after a 180 deg turn of the gravity vector and during 0-g simulation (fast-running clinostat). If there is no polar stimulus other than gravity, Loxodes shows a positive, Paramecium a negative gravitaxis. The results support the hypothesis that graviperception is an active physiological process. The cytoskeleton of Loxodes was investigated under 1-g conditions. While the microtubules can be shown by electron microscopy and immunofluorescence, the existence of actin in Loxodes is still in dispute. ESA

N89-15516*# Cornell Univ., White Plains, NY. Inst. of Chronobiology.
EFFECTIVENESS OF CIRCADIAN COUNTERMEASURES IN SIMULATED TRANSMERIDIAN FLIGHT SCHEDULES Final Technical Report
MARGARET L. MOLINE and TIMOTHY H. MONK 1989 24 p
(Contract NCC2-253)
(NASA-CR-184640; NAS 1.26:184640) Avail: NTIS HC A03/MF A01 CSCL 06P

The symptoms of jet-lag commonly afflict travelers who cross time zones. Insomnia during the new night, daytime fatigue, malaise, sleepiness, and gastrointestinal disturbances can occur for as long as 3 weeks after jet travel across even a few time zones. These symptoms are largely due to the slow rate of adjustment of the internal circadian timing system to the new time zone. Since business (or pleasure) can be seriously interrupted by such symptoms, it is important to determine ways to speed up the adjustment process to ameliorate the symptoms. Airline pilots have reported that they frequently nap to counter jet lag symptoms, and that they view this as a useful technique. Napping as a countermeasure would be attractive since it is practical and would take advantage of a naturally occurring phase of sleepiness after lunch. Napping also makes sense since insomnia is a common jet lag symptom. Thus, a laboratory simulation of jet lag was designed to test the ability of napping to increase the rate of adjustment following a time zone shift in a population of middle-aged men. Author

N89-15517*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SPACELAB 3 FLIGHT EXPERIMENT NO. 3AFT23: AUTOGENIC-FEEDBACK TRAINING AS A PREVENTIVE METHOD FOR SPACE ADAPTATION SYNDROME
PATRICIA S. COWINGS, WILLIAM B. TOSCANO, JOE KAMIYA, NEAL E. MILLER (Yale Univ., New Haven, CT.), and JOSEPH C. SHARP Oct. 1988 115 p
(NASA-TM-89412; A-87034; NAS 1.15:89412) Avail: NTIS HC A06/MF A01 CSCL 06S

Space adaptation syndrome is a motion sickness-like disorder which affects up to 50 percent of all people exposed to microgravity in space. This experiment tested a physiological conditioning procedure (Autogenic-Feedback Training, AFT) as an alternative to pharmacological management. Four astronauts participated as subjects in this experiment. Crewmembers A and B served as treatment subjects. Both received preflight training for control of heart rate, respiration rate, peripheral blood volume, and skin conductance. Crewmembers C and D served as controls (i.e., did not receive training). Crewmember A showed reliable control of his own physiological responses, and a significant increase in motion sickness tolerance after training. Crewmember B, however, demonstrated much less control and only a moderate increase in motion sickness tolerance was observed after training. The inflight symptom reports and physiological data recordings revealed that Crewmember A did not experience any severe symptom episodes during the mission, while Crewmember B reported one severe symptom episode. Both control group subjects, C and D (who took antimotion sickness medication), reported multiple symptom episodes on mission day 0. Both inflight data and crew reports indicate that AFT may be an effective countermeasure. Additional data must be obtained inflight (a total of eight treatment and eight control subjects) before final evaluation of this treatment can be made. Author

N89-16251# Florida Univ., Gainesville. Dept. of Physiology.
COMPLEX AUDITORY SIGNALS Final Report, 15 Sep. 1985 - 14 Sep. 1988
DAVID M. GREEN Sep. 1988 123 p
(Contract AF-AFOSR-0374-85; AF PROJ. 2313)
(AD-A199832; AFOSR-88-0985TR) Avail: NTIS HC A06/MF A01 CSCL 06D

Human detection of complex sounds were examined experimentally and theoretically. Three separate phenomena were studied: comodulation effects, perception of nonstationary spectra and detection of changes in static spectra. Results are briefly outlined and detailed in a number of attached preprints. GRA

N89-16252# School of Aerospace Medicine, Brooks AFB, TX.
USAF SCHOOL OF AEROSPACE MEDICINE CENTRIFUGE FACILITY: TECHNICAL INFORMATION Final Report, Feb. - Aug. 1988
ROBERT J. IRISH Sep. 1988 20 p
(AD-A199855; USAFSAM-TR-88-17) Avail: NTIS HC A03/MF A01 CSCL 06L

This technical report contains information about the U.S.A.F.S.A.M. centrifuge that includes systems specifications such as performance, payload restrictions, and data acquisition capabilities. Proof testing procedures are included for new fixtures and equipment; and a complete set of drawings of the gondola fixture are provided. GRA

N89-16253# Army Research Inst. of Environmental Medicine, Natick, MA.
ENVIRONMENTAL FACTORS. ACCLIMATIZATION: TRANSPORTING ATHLETES INTO UNIQUE ENVIRONMENTS
LAWRENCE E. ARMSTRONG 14 Jul. 1988 14 p
(AD-A199198; USARIEM-M-65-88) Avail: NTIS HC A03/MF A01 CSCL 06J

The human body does not successfully acclimatize to all environmental stresses. Therefore, the purpose of this article is to summarize the physiological changes which athletes can (or cannot) make, when exposed to high terrestrial altitude, air pollution, cold, and heat. This article will also present an overview of strategies which may be used during training and competition, to counteract these environmental insults. GRA

N89-16254# Army Research Inst. of Environmental Medicine, Natick, MA.
TREATMENT WITH TYROSINE, A NEUROTRANSMITTER PRECURSOR, REDUCES ENVIRONMENTAL STRESS IN HUMANS
L. E. BANDERET and H. R. LIEBERMAN 25 Jul. 1988 19 p
(Contract DA PROJ. 3E1-62787-A8-79)
(AD-A199199; USARIEM-M-64-88) Avail: NTIS HC A03/MF A01 CSCL 06O

Acutely stressful situations can disrupt behavior and deplete brain norepinephrine and dopamine, catecholaminergic neurotransmitters. In animals, administration of tyrosine, a food constituent and precursor of the catecholamines, reduces these behavioral and neurochemical deficits. It was investigated whether tyrosine (100 mg/kg) would protect humans from some of the adverse consequences of a 4.5 hour exposure to cold and hypoxia, conditions experienced in high mountainous regions. Tyrosine significantly decreased symptoms, adverse moods, and performance impairments in subjects who exhibited average or greater responses to these environmental conditions. This suggests that treatment with tyrosine should be evaluated in these and other acutely stressful situations for beneficial behavioral effects. GRA

N89-16255# Army Research Inst. of Environmental Medicine, Natick, MA.
THERMOREGULATION DURING COLD WATER IMMERSION IS UNIMPAIRED BY MUSCLE GLYCOGEN DEPLETION
ANDREW J. YOUNG, MICHAEL N. SAWKA, P. D. NEUFER, and STEPHEN R. MUZA Apr. 1988 31 p
(AD-A199203; USARIEM-M-51-88) Avail: NTIS HC A03/MF A01 CSCL 06J

This investigation studied the importance of muscle glycogen levels for body temperature regulation during cold stress. Physiological responses of eight euglycemic males were measured while they rested in cold water on two separate occasions. The trials followed a three-day program of diet and exercise manipulation designed to produce either high (EMG) or low (LMG) pre-immersion glycogen levels in the muscles of the legs, arms and upper torso. Pre-immersion vastus lateralis muscle glycogen concentrations were lower during the LMG trial than the HMG trial. There were no significant differences between the two trials in shivering as reflected by aerobic metabolic rate or in the amount of body cooling as reflected by changes in rectal temperature during the immersions. Post-immersion muscle glycogen levels remained unchanged from pre-immersion levels in both trials. Small but significant increases in plasma glucose and lactate concentration occurred during both immersions. Plasma glycerol increased during immersion in the LMG trial but not in the HMG trial. Plasma free fatty acid concentration increased during both immersion trials, but the change was apparent sooner in the LMG immersion. It was concluded that human thermoregulatory response to cold stress is not impaired by a substantial reduction in the muscle glycogen levels of several major skeletal muscle groups. GRA

N89-16256* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
VISUAL ACCOMMODATION TRAINER-TESTER Patent
ROBERT J. RANDLE, inventor (to NASA) 18 Oct. 1988 12 p
Continuation-in-part of US-Patent-Appl-SN-526741, filed 26 Aug. 1983, abandoned
(NASA-CASE-ARC-11426-2; US-PATENT-4,778,268; US-PATENT-APPL-SN-827185; US-PATENT-CLASS-351-203; US-PATENT-CLASS-351-237) Avail: U.S. Patent and Trademark Office CSCL 06B

An apparatus for training the human visual accommodation system is described. Specifically, the apparatus is useful for training personnel to volitionally control focus to the far point (normally

infinity) from a position of myopia due to functional causes. The functional causes could be due, for example, to a behavioral accommodative spasm or the effects of an empty field. The device may also be used to measure accommodation, the accommodation resting position and the near and far points of vision. The device comprises a number of optical elements arranged on a single optical axis. Several of the elements are arranged in order on a movable stage in fixed relationship to each other: a light source, a lens, a target, an aperture and/or a second lens. On a base and in fixed relationship to each other are eyepiece and third lens. A stage generates an image of the target and the stage is movable with respect to the base by means of a knob. The device is utilized for the various training and test functions by following a series of procedural steps, and interchanging the apertures as necessary for the selected procedure.

Official Gazette of the U.S. Patent and Trademark Office

N89-16257# National Academy of Sciences - National Research Council, Washington, DC. Committee on Polar Biomedical Research.

IMPLEMENTATION OF ASSESSMENT OF POLAR BIOMEDICAL RESEARCH Final Report, 15 Oct. 1983 - 14 Apr. 1985

RAPHAEL KASPER 1 Aug. 1988 53 p

(Contract DAMD17-84-G-4010; DA PROJ. 3E1-62777-A-879)

(AD-A200058) Avail: NTIS HC A04/MF A01 CSCL 08F

Today, the world is becoming increasing aware of the strategic, commercial, and political importance of the polar regions. The U.N. and many previously uninvolved second and third world countries are giving greater attention to Antarctica; WHO continues its special concern with issues and problems of arctic circumpolar health; and the U.S. recently enacted an Arctic Research and Policy Act and prepared an Arctic Research Plan, and continues its active participation in antarctic research and policy as well. The Polar Research Board (PRB) of the National Research Council's Commission on Physical Sciences, Mathematics, and Resources established an ad hoc Committee on Polar Biomedical Research in 1980 to review and report on research needs as part of a broader PRB effort to develop a strategy for polar research over the coming decade or so. The committee published its findings and recommendations in fall 1982; this appendix to the committee's initial report further considers U.S. polar biomedical research needs--particularly for more effective coordination of data collection and data access, and the stimulation of careers in polar biomedical research. GRA

N89-16258# Nevada Univ., Las Vegas. Desert Biology Research Center.

PHYSIOLOGICAL STRESSES ASSOCIATED WITH US AIR FORCE GROUNDCREW ACTIVITIES Final Report, Aug. 1983 - Aug. 1984

MOHAMMAD K. YOUSEF, CHARLES T. RASMUSSEN, and LOREN G. MYHRE May 1988 51 p

(Contract F33615-83-D-0603)

(AD-A200099; USAFSAM-TR-85-61) Avail: NTIS HC A04/MF A01 CSCL 06J

This study of the rapid turn-around operation involving F-16 aircraft at Nellis AFB, NV, was performed from August 1983 to April 1984. A total of 38 rapid turn-around exercises were conducted at a site off the regular runway. Each exercise was performed by a team of five men (two crew chiefs, two loaders, and the Jammer driver) and was completed within 18 to 36 min. Members of the team wore either fatigues or CWDE. Regardless of the air temperature and the ensemble worn, the average VO2 of the loaders was 40 to 59 percent higher than that of the crew chiefs. The average VO2 of the Jammer driver was 12 percent higher than that of the crew chiefs. Changes in HR were similar to those observed for the VO2. The total-body SR of individuals wearing the CWDE was consistently higher than when the same individuals wore fatigues. The rate of rise in rectal temperature and skin temperature while performing the task was greater when wearing the CWDE than when wearing fatigues. Resting after completing a turn-around did not reduce heat stress when the CWDE was worn. GRA

N89-16259# Oregon Univ., Eugene. Dept. of Computer and Information Science.

BINOCULAR DEPTH AND THE PERCEPTION OF VISUAL SURFACES

KENT A. STEVENS and ALLEN BROOKES 27 Sep. 1988 34 p

(Contract N00014-87-K-0321; RR04209)

(AD-A200340) Avail: NTIS HC A03/MF A01 CSCL 06D

This technical report consists of two publications. The first is the first chapter of a Ph.D. dissertation completed this summer. The chapter provides an overview of the work on depth from stereopsis. The second part of the report is a reprint of an article appearing in Vision Research which describes set of experiments that shown an insensitivity to constant gradients of disparity and suggest that places with nonzero second derivatives of disparity are used for computing depth. GRA

N89-16260# Naval Aerospace Medical Research Lab., Pensacola, FL.

COMPLEX VISUAL INFORMATION PROCESSING: A TEST FOR PREDICTING NAVY PRIMARY FLIGHT TRAINING SUCCESS Interim Report, 1986 - 1987

TOMMY R. MORRISON Jul. 1988 23 p

(AD-A200394; NAMRL-1338) Avail: NTIS HC A03/MF A01 CSCL 05I

A continuing problem in Naval aviation is how to identify, prior to training, those individuals having the greatest likelihood to succeed in flight training. Since World War II the U.S. Navy has been concerned with the development of selection tests to improve its capability to screen individuals desiring entry into flight training. Improved aviation personnel selection tests could reduce attrition, and consequently, the monetary losses associated with this attrition. Additionally, the Navy would expose fewer flight students to a potentially hazardous training situation. A research methodological problem associated with the development of candidate tests for predictive validation is: How do we design a test that measures abilities relevant for inclusion in validation studies. A methodology, Random Sampling of Domain Variances, was developed as a product of the Augmentation of Human Factors Engineering Technology Efforts Program. This methodology provided the basis for developing a complex visual information task designed to require many basic cognitive processing demands thought to be required in performing aviation display tasks. This complex visual display task should be further evaluated in a cross-validation study and then considered for implementation as a performance-based selection test. The method of Random Sampling of Domain Variances should be considered as a methodological tool in the design of future tests to be selected for validation studies. GRA

N89-16261# Defence Research Establishment Pacific, Victoria (British Columbia).

VISUAL DETECTION OF LOW CONTRAST BANDS IN SPECKLED IMAGERY

MICHAEL J. WILMUT Oct. 1987 21 p

(AD-A200473; DREP-TM-87-7) Avail: NTIS HC A02/MF A01 CSCL 17E

The human visual system performance in detecting low contrast bands in speckled imagery was examined. For exactly known signals it was found that approximately a 4.9-fold increase in signal amplitude was needed to achieve results comparable to the optimum matched filter detector. For signals of random orientation this factor is approximately 4.6. Due to the complex and largely unknown nature of the human visual system and the choices that must be made in preparing the images, caution must be exercised when applying these results. GRA

N89-16262# Krug International, San Antonio, TX. Technology Services Div.
RESEARCH ON THE OCULAR EFFECTS OF LASER RADIATION. EXECUTIVE SUMMARY Final Report, Sep. 1987 - Feb. 1988
JOSEPH A. ZUCLICH, RANDOLPH D. GLICKMAN, DENISE C. VARNER, WILLIAM D. KOESNIK, and JAMES C. BRAKEFIELD Sep. 1988 29 p
(Contract F33615-84-C-0600)
(AD-A200528; USAFSAM-TP-88-8) Avail: NTIS HC A03/MF A01 CSCL 06G

The objective of the research was to evaluate the bioeffects of laser radiation in order to quantify threats, primarily losses of visual function (transient or permanent), which might affect performance during critical phases of military operations. The results of this research have also been applied to evaluating current laser safety standards and identifying the need for additional safety criteria. The Executive Summary is presented in seven parts dealing with the effects of laser exposures on vision via one or more of the following approaches: electrophysiological measures of visual function degradation; psychophysical measures of visual function degradation quantitative evaluation of observable ocular damage and predictive modeling of laser radiation interactions with the eye and with visual performance. Also included is an Appendix which lists the publications and presentations generated as a result of this contract. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A89-21802* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN INTELLIGENT TRAINING SYSTEM FOR SPACE SHUTTLE FLIGHT CONTROLLERS
R. BOWEN LOFTIN (NASA, Johnson Space Center, Houston; Houston, University, TX), LUI WANG, PAUL BAFFLES (NASA, Johnson Space Center, Houston, TX), and GRACE HUA (Computer Sciences Corp., Houston, TX) (NASA, 1988 Goddard Conference on Space Applications of Artificial Intelligence, Greenbelt, MD, May 24, 1988) Telematics and Informatics (ISSN 0736-5853), vol. 5, no. 3, 1988, p. 151-161. Previously announced in STAR as N88-30331. refs

An autonomous intelligent training system which integrates expert system technology with training/teaching methodologies is described. The system was designed to train Mission Control Center (MCC) Flight Dynamics Officers (FDOs) to deploy a certain type of satellite from the Space Shuttle. The Payload-assist module Deploys/Intelligent Computer-Aided Training (PD/ICAT) system consists of five components: a user interface, a domain expert, a training session manager, a trainee model, and a training scenario generator. The interface provides the trainee with information of the characteristics of the current training session and with on-line help. The domain expert (Dep1Ex for Deploy Expert) contains the rules and procedural knowledge needed by the FDO to carry out the satellite deploy. The Dep1Ex also contains mal-rules which permit the identification and diagnosis of common errors made by the trainee. The training session manager (TSM) examines the actions of the trainee and compares them with the actions of Dep1Ex in order to determine appropriate responses. A trainee model is developed for each individual using the system. The model includes a history of the trainee's interactions with the training system and provides evaluative data on the trainee's current skill level. A training scenario generator (TSG) designs appropriate training exercises for each trainee based on the trainee model and the training goals. All of the expert system components of PD/ICAT communicate via a common blackboard. The PD/ICAT is currently being tested. Ultimately, this project will serve as a vehicle for developing a general architecture for intelligent training systems together with a software environment for creating such systems. Author

A89-21829
INVESTIGATION TRENDS IN SPACE PSYCHOLOGY IN POLAND DURING 1981-1986 [KIERUNKI BADAN PSYCHOLOGII KOSMICZNEJ W POLSCE W LATACH 1981-1986]
JAN TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 7-18. In Polish. refs

Investigation trends in space psychology are discussed. The present research was carried out within the framework of interdepartmental programs at the Polish Academy of Sciences during 1981-1986. K.K.

A89-21830
THE COST OF HUMAN ADAPTATION TO SITUATIONS OF PERCEPTIVE DEPRIVATION AND SOCIAL ISOLATION [KOSZT ADAPTACJI CZLOWIEKA DO SYTUACJI DEPRYWACJI PERCEPCYJNEJ I IZOLACJI SOCJALNEJ]
JAN TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 19-34. In Polish. Research supported by the Polska Akademia Nauk. refs

Human psychophysiological and psychological responses to extreme situations of perceptive deprivation and social isolation are characterized. Laboratory tests and studies performed under natural conditions suggest that human adaptation to such conditions is associated with a certain psychophysiological and psychological cost. K.K.

A89-21831
THE EFFECT OF RELAXATION ON PERCEPTION-MOTOR PERFORMANCE [WPLYW RELAKSACJI NA SPRAWNOSC PERCEPCYJNO-MOTORYCZNA]
JANINA MACIEJCZYK and JAN TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 35-45. In Polish. Research supported by the Polska Akademia Nauk. refs

The effect of relaxation techniques proposed by Schultz (1960) and Luthe (1969-1972) on perception-motor performance is examined. Thirteen people (men and women ranging in age from 20-35) underwent relaxation training for a period of two months to two years. Their perception-motor performance was measured using pencil and paper type tests and various types of devices. The results showed improved performance in certain perception-motor tests as well as a decrease in pulse rate, arterial pressure, and the level of anxiety. K.K.

A89-21832
THE RELATIONSHIP BETWEEN STRESS LOAD, ANXIETY, AND SELF-IMAGE IN 45-50 YEAR OLD MALES [OBCIAZENIE STRESEM A LEK I OBRAZ SIEBIE U MEZCZYZN W WIEKU 45-50 LAT]
STANISLAW SIEK (Polskie Linie Lotnicze LOT, Warsaw, Poland) and JAN TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 47-54. In Polish. Research supported by the Polska Akademia Nauk. refs

An attempt is made to find possible correlations between the stress load of everyday life, the level of anxiety, and the self image of 45-50-yr old professional men. It was found that the indices of loads produced by the stresses of everyday life are positively correlated with anxiety levels and positively or negatively correlated with certain characteristics of self image. K.K.

A89-21833
THE INTERRELATIONSHIP BETWEEN CERTAIN TEMPERAMENT AND PERSONALITY TRAITS [ZWIAZKI MIEDZY WYBRANYMI CECHAMI TEMPERAMENTU I OSOBOWOSCI]
WLODZIMIERZ ONISZCZENKO (Warszawa, Uniwersytet, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 1-2, 1988, p. 55-65. In Polish. refs

The interrelationship between the temperament and personality traits determining individual tolerance to stress is examined. Positive correlations are found between social approval, the strength of excitation and inhibition processes, and the mobility of nervous processes. Positive correlations are also found between the localization of control, agitation, anxiety, and nervousness. K.K.

A89-22541* Pennsylvania Coll. of Optometry, Philadelphia.
SPATIAL CONTRAST SENSITIVITY - EFFECTS OF AGE, TEST-RETEST, AND PSYCHOPHYSICAL METHOD
KENT E. HIGGINS (Pennsylvania College of Optometry, Philadelphia), MYLES J. JAFFE (PHS, National Institute of Mental Health, Washington, DC), RAFAEL C. CARUSO, and FRANCISCO M. DEMONASTERIO (NIH, National Eye Institute, Bethesda, MD) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 5, Dec. 1988, p. 2173-2180. refs
(Contract NCA2-202)

Two different psychophysical methods were used to test the spatial contrast sensitivity in normal subjects from five age groups. The method of adjustment showed a decline in sensitivity with increasing age at all spatial frequencies, while the forced-choice procedure showed an age-related decline predominantly at high spatial frequencies. It is suggested that a neural component is responsible for this decline. K.K.

A89-22669
THE ROLE OF PRACTICE IN DUAL-TASK PERFORMANCE - TOWARD WORKLOAD MODELING IN A CONNECTIONIST/CONTROL ARCHITECTURE
WALTER SCHNEIDER and MARK DETWEILER (Pittsburgh, University, PA) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 539-566. refs
(Contract MDA903-86-C-0149; N00014-86-K-0107; N00014-86-K-0678)

A theoretically based approach to understanding dual-task training and performance is presented, which explains the observed limited single-task to dual-task transfer effects. The model predicts that, as a skill is acquired and the performance progresses through successive phases, a qualitative change occurs in processing, which enables multiple-task performance. Seven compensatory activities occur in the model during multitask training, the development of which provides an interpretation of the large practice effects observed in dual-task situations. It is emphasized that models of dual-task performance must deal with issues of practice. I.S.

A89-22670
EXAMINATION OF THE ROLE OF 'HIGHER-ORDER' CONSISTENCY IN SKILL DEVELOPMENT
ARTHUR D. FISK (Georgia Institute of Technology, Atlanta), NATALIE A. ORANSKY, and PAULA R. SKEDSVOLD (South Carolina, University, Columbia) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 567-581. refs
(Contract F30602-81-C-0193)

Three experiments were conducted to test the hypothesis that subjects can, in some instances, utilize higher-order consistencies. In the first experiment, subjects were asked to make either a consistent or a varied decision concerning the ordinal value of numbers in a display. In the second, stimuli were used that had no preexperimental relational ordering. The third experiment tested the importance of consistent relationships by randomly ordering the symbols on each trial. The data obtained included the reaction times for the subjects' performance early (first 360 trials) and late in training, the effect of frame size, and the serial position effect. It was found that subjects could develop performance indicative of automatic processing if the relationships among stimuli remained consistent. Results also suggested that local-level (or stimulus-based) consistency is not necessary for automatic process development if task-relevant higher-order (or global) consistency can be identified and used by the trainees. I.S.

A89-22671
AUTOMATICITY, RESOURCES, AND MEMORY - THEORETICAL CONTROVERSIES AND PRACTICAL IMPLICATIONS
GORDON D. LOGAN (Illinois, University, Champaign) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 583-598. refs
(Contract NSF BNS-87-10436)

This paper considers the theoretical controversy over the concept of automaticity, i.e., the battle between two factions, one of which describing automaticity as a way to overcome resource limitation, while the other viewing it as a memory phenomenon reflecting the consequences of running a large data base through an efficient retrieval process. Particular attention is given to the implications of the controversy for the design of training programs. It is shown that the memory view provides better answers to the basic issues in automaticity than the resource view, particularly for questions concerning training. I.S.

A89-22672* Illinois Univ. at Urbana-Champaign, Savoy.
CODES AND MODALITIES IN MULTIPLE RESOURCES - A SUCCESS AND A QUALIFICATION
CHRISTOPHER D. WICKENS and YILI LIU (Illinois, University, Savoy) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 599-616. refs
(Contract NAG2-308)

The relevance of codes and modalities in a multiple-resource model to the prediction of task interference was investigated in an experiment in which either verbal or spatial decision tasks, responded to with either voice or key press, were time-shared with second-order tracking. Results indicate the importance of the dichotomy between verbal and spatial processing codes in accounting for task interference. Interference with tracking was consistently greater, and difficulty/performance trade-offs were stronger, when the spatial decision task was performed and the manual response was used. A review of the literature on the interference between a continuous visual task and a discrete task whose modality is either auditory or visual suggests that scanning produces a dominant cost to intramodal configurations when visual channels are separated in space. In absence of visual separation, the differences between cross-modal and intramodal performance may be best accounted for by a mechanism of preemption. I.S.

A89-22673
MULTIPLE RESOURCES FOR PROCESSING AND STORAGE IN SHORT-TERM WORKING MEMORY
STUART T. KLAPP and ALLAN NETICK (California State University, Hayward) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 617-632. Research supported by the University of California. refs
(Contract F33615-83-K-0039)

The hypothesis that performance in decision making and planning is severely restricted by the limited capacity of short-term working memory was verified in experiments that compared the amount of interference by additional tasks on two reference tasks, called probe digit (PD) and missing digit (MD), which involved the presentation of eight digits in random sequence and in the same modality. Both PD and MD tasks involved a single-digit output response, but differed in their demands for working memory resources. While the PD task required that subjects remember the digits in order, the MD task required only that the items be retained (without reference to order). The results indicate that resource composition depends on internal mediators even when stimulus and response modality are held constant. It is suggested that there are at least two systems of working memory that differ in resource composition, and that this difference appears in both processing and storage. I.S.

A89-22674
TASK-SHARING WITHIN AND BETWEEN HEMISPHERES - A MULTIPLE-RESOURCES APPROACH
MARTHA CAMPBELL POLSON (Colorado, University, Boulder) and ALINDA FRIEDMAN (Alberta, University, Edmonton, Canada) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 633-643. Research supported by the University of Colorado and NSERC. refs

A model is presented which proposes that each cerebral hemisphere accesses an independent resource supply that can be shared among many types of tasks, including those with no obvious similarities. Evidence is presented supporting the hypothesis that the hemisphere in which processing takes place is of primary importance in understanding how tasks interact. The model implies that tasks may or may not overlap in their resource demand, and the only way to determine this reliably is with a task emphasis manipulation. The available evidence indicates that the multiple-resource model is viable. I.S.

A89-22675
CAPACITY EQUIVALENCE CURVES - A DOUBLE TRADE-OFF CURVE METHOD FOR EQUATING TASK PERFORMANCE
HERBERT A. COLLE, JOHN R. AMELL, MICHAEL E. EWRY, and MARY-LOUISE JENKINS (Wright State University, Dayton, OH) Human Factors (ISSN 0018-7208), vol. 30, Oct. 1988, p. 645-656. refs
(Contract F33615-85-D-0514)

A dual-task technique for developing mental workload scales is described and evaluated. This technique, the method of double trade-off curves, can be used to equate secondary task performance levels of different tasks. The results from two different mental workload experiments were consistent with the assumptions underlying the technique. Author

A89-24370
USAF PILOT SELECTION AND CLASSIFICATION SYSTEMS
THOMAS R. CARRETTA (USAF, Human Resources Laboratory, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 46-49.

A total of 478 pilot candidates were given a computerized test battery, the Basic Attributes Test (BAT) currently being validated for pilot selection and classification. The battery included tests of psychomotor and cognitive/perceptual abilities and personality/attitudinal characteristics. Results indicated that several of the BAT tests were able to improve the prediction of graduation/elimination from flight training and follow-on training recommendation (fighter or nonfighter aircraft) above that provided by currently used paper-and-pencil tests. It was concluded that several of the BAT performance measures were capturing skills and abilities related to flight training performance that are not being assessed by currently used selection instruments. Implications for pilot selection and classification procedures are discussed. Author

A89-24372
THE GIANT HAND PHENOMENON
TERENCE J. LYONS and CARL G. SIMPSON (USAF, Clinic, Spangdahlem AFB, Federal Republic of Germany) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, Jan. 1989, p. 64-66. refs

The 'giant hand' is a form of recognized spatial disorientation. An experienced fighter pilot described the events leading up to ejection from his out-of-control aircraft. Investigation of the mishap found no flight control problems and attributed the accident to the giant hand phenomenon. A survey of tactical aircrews indicated that this form of spatial disorientation is not an unusual occurrence. Past training of aircrew to deal with this problem has been inadequate. Earlier reports of this phenomenon recommended attempting to recover the aircraft by grasping the stick using only the thumb and index finger rather than the entire hand. Further investigation to include simulation of this phenomenon in advanced spatial disorientation trainers should contribute to aviation safety. Author

A89-24646* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVED WORD RECOGNITION FOR OBSERVERS WITH AGE-RELATED MACULOPATHIES USING COMPENSATION FILTERS
TERI B. LAWTON (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Clinical Vision Sciences (ISSN 0887-6169), vol. 3, no. 2, 1988, p. 125-135. refs

A method for improving word recognition for people with age-related maculopathies, which cause a loss of central vision, is discussed. It is found that the use of individualized compensation filters based on an person's normalized contrast sensitivity function can improve word recognition for people with age-related maculopathies. It is shown that 27-70 pct more magnification is needed for unfiltered words compared to filtered words. The improvement in word recognition is positively correlated with the severity of vision loss. R.B.

A89-24846
CENTRAL FLICKER FUSION FREQUENCY AND ITS POSSIBLE UTILIZATION FOR PILOTS AND ASTRONAUTS SELECTION
G. ROTONDO and G. MEINERI (Aeronautica Militare Italiana, Rome, Italy) IN: Space safety and rescue 1986-1987. San Diego, CA, Univelt, Inc., 1988, p. 23-25. refs
(IAF PAPER 86-59D)

A description of the employment of CFF (Central Flicker Fusion) frequency for its possible employment in pilots' and astronauts' selection is given. Following is a description of the technical means adopted. They dwell upon the employment of CFF on payload-scientist candidates to be submitted both to radial and angular acceleration. Author

N89-15518# California Univ., Santa Barbara. Graduate School of Education.
INDIVIDUAL DIFFERENCES IN SKILL ACQUISITION: INFORMATION PROCESSING EFFICIENCY AND THE DEVELOPMENT OF AUTOMATICITY Final Technical Paper, Apr. 1983 - Mar. 1986
JAMES W. PELLEGRINO Jul. 1988 153 p
(Contract F41689-83-C-0017)
(AD-A198310; AFHRL-TR-87-52) Avail: NTIS HC A08/MF A01 CSCL 05H

Results are reported for a series of 13 studies examining individual differences in information processing efficiency. The tasks used represented different content domains and levels of processing complexity. Measures of information processing speed showed little relationship to each other and/or standardized ability measures. The results are considered relative to issues of assessing: (1) an individual's current levels of information processing efficiency, and (2) movement toward more automatic or efficient processing levels. Assessment of the latter is problematic and may require complex tasks performed over intervals of time longer than 2 to 5 hours. Finally, standardized ability measures only partially reflect an individual's current levels of processing efficiency. GRA

N89-15519# Paris V Univ. (France). Psychologie Experimental.
TIME PERCEPTION AND EVOKED POTENTIALS Final Research Note, Sep. 1981 - Sep. 1983
PAUL FRAISSE Jul. 1988 50 p
(Contract DAJA37-81-C-0211; DA PROJ. 2Q1-61102-B-74-F)
(AD-A198616; ARI-RN-88-69) Avail: NTIS HC A03/MF A01 CSCL 05H

In this research note, time perception is studied from a psychophysical and electrophysiological point of view, during durations reproduction experiments. No relation was found between the auditory evoked potential (AEP) amplitude and durations reproduction errors. The AEP amplitude is influenced, however, by the interval between the clicks and the repetition of the stimulations. The results of the durations reproduction task show an over-estimation of the shorter intervals and an under-estimation of the longer ones. GRA

N89-15520# California Univ., Los Angeles. Visual Psychophysics Lab.
DEVELOPMENT OF A CHROMATIC/LUMINANCE CONTRAST SCALE Interim Report
LYNN A. OLZAK, JAMES P. THOMAS, and HAROLD STANISLAW Dec. 1987 126 p
(Contract DTCG39-C-86-80205)
(AD-A198628; USCG-D-12-88; CGR/DC-19/87) Avail: NTIS HC A07/MF A01 CSCL 06D

A model was developed to predict the detectability of small low-contrast targets viewed against a uniform background in daylight conditions. The model quantitatively describes the interrelationships among detectability, target size, target luminance, target chromaticity, background chromaticity, and background luminance. A theoretical approach was used to develop a general form of the predictive model. Two empirical studies were performed to estimate parameters of the model, and a final study was performed to validate the model. The final model is presented in two forms, both easily used in field situations. The first predicts detectability of a specified target (size, luminance and chromaticity) when viewed against a specified background (luminance and chromaticity). The second predicts the distance at which such a target will be detected. A guide to the use of the model is included. GRA

N89-15521# Texas Christian Univ., Fort Worth. Dept. of Psychology.
STRATEGY-BASED TECHNICAL INSTRUCTION: DEVELOPMENT AND EVALUATION Final Report, Sep. 1984 - Jun. 1988
DONALD F. DANSEREAU Aug. 1988 196 p Sponsored by ARI, Alexandria, VA
(AD-A199903; REPT-0002AB; ARI-RN-88-82) Avail: NTIS HC A09/MF A01 CSCL 05H

This research note discusses scripted peer cooperation, an economical and effective technique for improving the acquisition of technical knowledge and skills. Experiences with scripted cooperation have also been shown to facilitate transfer to individual learning situations and to unscripted groups. At a more specific level, the research behind this note has identified parameters relevant to the assignment of participants to dyads based on pre-measured characteristics, to the selection of scripts dependent on target tasks and the outcomes desired, and to the use of node-link knowledge maps as communications props. In addition, we have used our detailed analyses of cooperative interactions to develop models of task-oriented group processing. This research program has thus provided a basis for the development of an information processing model of cooperative learning, and our detailed analysis of this approach has been a first step in providing a conceptual framework for this powerful educational technique. GRA

N89-15522# Naval Ocean Systems Center, San Diego, CA.
TEMPORAL KNOWLEDGE: RECOGNITION AND LEARNING OF TIME-BASED PATTERNS Final Report
CAREY E. PRIEBE, DAVID J. MARCHETTE, and CHEN-HAN SUNG Aug. 1988 17 p
(AD-A199911; NOSC/TD-1334) Avail: NTIS HC A03/MF A01 CSCL 12I

A self-organizing, distributed, massively parallel network anatomy for the recognition of input stimuli and the learning of temporal patterns is proposed. The network adapts itself to recognize individual incoming events in the first, or static, subsystem. These recognized events, received by the system over time, are simultaneously categorized as specific sequences by the temporal subsystem. Separate attentional mechanisms allow for the recognition of events with a low signal-to-noise ratio while simultaneously allowing attention in the temporal subsystem to be focused only on sequences that meet some minimum length criterion. The static subsystem is based on the adaptive resonance paradigm of S. Grossberg. The temporal subsystem, a Gaussian classifier, processes the static information produced by the first subsystem. These Gaussian classifications represent the statistics of the temporal data and use a scheme of moving mean and moving covariance to update the classes. Via supervised learning these self-developed classes are then combined into an overall probability estimate using a bayesian probability scheme. GRA

N89-15523# Air Force Human Resources Lab., Brooks AFB, TX.
PERSONALITY, ATTITUDES, AND PILOT TRAINING PERFORMANCE: FINAL ANALYSIS Interim Report, Sep. 1983 - Dec. 1987
FREDERICK M. SIEM and THOMAS R. CARRETTA Oct. 1988 32 p
(AD-A199983; AFHRL-TP-88-23) Avail: NTIS HC A03/MF A01 CSCL 05H

Developments in research concerning personality characteristics have led to a renewed interest in applications of individual differences measures for selection of pilot candidates. Recent research efforts have focused on selecting for positive characteristics, rather than screening out pathological traits. Another development is the use of tests in which the dimension of interest is not readily apparent to the test taker. In the present investigation, five personality and attitudinal tests were administered to United States Air Force (USAF) pilot candidates as part of an experimental test battery under consideration for operational use in pilot selection and classification, the Basic Attributes Tests (BAT) System. These tests were designed to assess decisiveness, risk-taking, self-confidence, survival attitudes, and field dependence-independence. Scores from these tests were examined for their utility in predicting final training outcome (graduation or elimination) and a follow-on training assignment (fighter or non-fighter aircraft). Results indicated that as a group the tests demonstrated weak relationships with the performance criteria. No test was valid against both performance outcomes. Measures from all five tests were combined into a model that also included scores from the Air Force Officer Qualifying Test (AFOQT), the paper-and-pencil examination currently used for USAF pilot selection. GRA

N89-15524# Rutgers - The State Univ., New Brunswick, NJ. Dept. of Psychology.
EYE MOVEMENTS AND VISUAL INFORMATION PROCESSING Final Progress Report, Jan. 1985 - Mar. 1988
EILEEN KOWLER 2 Aug. 1988 7 p
(Contract AF-AFOSR-0022-85; AF PROJ. 2313)
(AD-A200006; AFOSR-88-1139TR) Avail: NTIS HC A02/MF A01 CSCL 06D

Eye movements are needed to acquire visual information because clear vision is available only at the center of the retina. The main objectives of the research are to understand that cognitive and sensory factors underlying the control of eye movements, and to understand how visual processing depends on the eye movements used to inspect displays. Experiments were completed shows that: (1) smooth pursuit becomes poor when the frequency of target motion exceeds 0.5 Hz even when the amplitude of motion is small (less than 30') so that average target velocity is low (Martins et al., 1985f); (2) the acquisition of information from visual displays is not limited by the directional pattern of saccades but is limited by size: small (less than 30') saccades, required to inspect small details not forming recognizable visual patterns, cannot be controlled accurately without latencies of several hundred milliseconds. GRA

N89-15525# Missouri Univ., Columbia. Dept. of Statistics.
CALIBRATION OF TEST ITEM AND MEASUREMENT OF ABILITIES Final Report, 1 Jan. 1985 - 30 Sep. 1988
ROBERT K. TSUTAKAWA Sep. 1988 17 p
(Contract N00014-85-K-0113; RR04204)
(AD-A199435) Avail: NTIS HC A03/MF A01 CSCL 12C

The overall goal of this project is to develop new Bayesian procedures for mental testing. A typical test, which is studied here, consists of k test items administered to n examinees. The data consists of an nxk matrix of binary responses indicating which of the k items are scored correctly and which incorrectly by each of

the n examinees. The statistical procedures are based on the assumption that there is a model which specifies the probability of a correct response to each item as a function of an unidimensional ability. Such functions are assumed to belong to certain families such as, the two-parameter logistic (2PL) or three-parameter (3PL) curves. These curves are identified by parameters called item parameters. When these models are used for testing, a set of items is initially calibrated using a moderately large value for n (the sample size). The calibration consists of estimating the item parameters. The calibrated curves are then used to score abilities of new examinees. GRA

N89-15526# Naval Aerospace Medical Research Lab., Pensacola, FL.

DEVELOPMENT AND EVALUATION OF AN AUTOMATED SERIES OF SINGLE-AND MULTIPLE-DICHOTIC LISTENING AND PSYCHOMOTOR TASKS Interim Report, for Period Ending 1987

GLENN R. GRIFFIN and PETER D. COLLYER Dec. 1987 18 p

(AD-A199490; NAMRL-1336) Avail: NTIS HC A03/MF A01 CSCL 05H

Attrition in undergraduate naval aviation training is costly. An average of 25 percent of student naval aviators fails to complete training. This study reports an effort to develop automated single- and multiple-dichotic listening and psychomotor tasks, which have the potential to reduce aviator attrition through improved selection and may also be useful in initial pipeline classification. Statistical analysis of Study 1, comparing a forward and backward series of automated dichotic listening (DLT) and psychomotor (PMT) tasks, indicated that a backward-direction orientation associated with the psychomotor tests resulted in increased difficulty for all PMT measures and two of three multitask DLT measures. The correlational estimates of test-retest reliability for the multitask DLT and PMT measures were adequate for both series of automated tasks but slightly higher ($r = .80$ DLT, $r = .90$ PMT) for the backward series. The relation between such seemingly different tasks is difficult to understand since the DLT is an auditory cognitive processing task, and the PMT is an eye, hand, foot coordination task. However, the significant correlations were both smaller and fewer in number for the backward series of automated tests. Study 2 was a correlational evaluation between the new automated multitask measures and old nonautomated tasks with demonstrated validity for the prediction of primary flight performance. The results of Study 3 indicated that certain automated DLT and PMT measures were significantly related to primary flight grades (PFG) in Navy flight training. GRA

N89-15527# Naval Aerospace Medical Research Lab., Pensacola, FL.

SOME CONSIDERATIONS IN THE DESIGN OF A COMPUTERIZED HUMAN INFORMATION PROCESSING BATTERY Final Report, Aug. 1985 - Feb. 1986

DIANE L. DAMOS Dec. 1987 56 p

(AD-A199491; NAMRL-MONOGRAPH-35) Avail: NTIS HC A04/MF A01 CSCL 05H

A test battery is nothing more than a set of tests that, as a whole, measure certain skills, abilities, and processes. This report discusses general issues and problems associated with the development of computerized human information processing test batteries. It is concerned primarily with batteries that will be administered in a repeated-measures paradigm although some of the information pertains to the construction of any battery. Among the issues discussed in the report are task selection, task ordering, the use of pacing, and hardware and software implementation problems. Implementation problems associated with specific information processing tasks--such as mental arithmetic tasks and vigilance tasks--are also described. This report is intended for individuals who have a limited knowledge of human information processing and the pitfalls associated with computer-based testing. GRA

N89-15528# Army Natick Research and Development Command, MA.

PSYCHOSOCIAL ACCOMMODATION TO GROUP CONFINEMENT IN THE ADVANCED BASE HABITAT Final Technical Report, Oct. 1986 - Jun. 1988

PHILIP H. WARREN 1 Jun. 1988 35 p

(AD-A199588; NATICK/TR-88/063) Avail: NTIS HC A03/MF A01 CSCL 05H

There are many military situations in which small groups of individuals must live and function in confining environments for extended periods of time. The U.S. Air Force, through its contractor Hamilton Standard, has developed a model for an Advanced Base Habitat for long-term living underground. Initial manned tests of a prototype of this Advanced Base focused on engineering and life-support issues. However, having personnel living in the Habitat during the tests provided an opportunity to assess the psychological effects of the Habitat. Three tests were conducted with four crew members each; two tests of four days each, and one of seven days. Following each of the tests an interview was conducted with the crew as a group. In each test interpersonal conflict developed. This report describes how the crews dealt with the conflicts and other stressors associated with life in the Habitat. GRA

N89-15529*# California Univ., Davis. Dept. of Psychology.

IMPLICATIONS OF PRIVACY NEEDS AND INTERPERSONAL DISTANCING MECHANISMS FOR SPACE STATION DESIGN

ALBERT A. HARRISON, ROBERT SOMMER, NANCY STRUTHERS, and KATHLEEN HOYT Aug. 1988 53 p

(Contract NAG2-357)

(NASA-CR-177500; NAS 1.26:177500) Avail: NTIS HC A04/MF A01 CSCL 05I

Isolation, confinement, and the characteristics of microgravity will accentuate the need for privacy in the proposed NASA space station, yet limit the mechanism available for achieving it. This study proposes a quantitative model for understanding privacy, interpersonal distancing, and performance, and discusses the practical implications for Space Station design. A review of the relevant literature provided the basis for a database, definitions of physical and psychological distancing, loneliness, and crowding, and a quantitative model of situational privacy. The model defines situational privacy (the match between environment and task), and focuses on interpersonal contact along visual, auditory, olfactory, and tactile dimensions. It involves summing across pairs of crew members, contact dimensions, and time, yet also permits separate analyses of subsets of crew members and contact dimensions. The study concludes that performance will benefit when the type and level of contact afforded by the environment align with that required by the task. The key to achieving this is to design a flexible, definable, and redefinable interior environment that provides occupants with a wide array of options to meet their needs for solitude, limited social interaction, and open group activity. The report presents 49 recommendations in five categories to promote a wide range of privacy options despite the space station's volumetric limitations. Author

N89-15530*# Washington Univ., Seattle. Coll. of Architecture and Urban Planning.

THE QUANTITATIVE MODELLING OF HUMAN SPATIAL HABITABILITY

JAMES A. WISE, CHERLY GEISENDORFER, BEVERLY TIEDJE, DAVID LANTRIP, BRIAN JOHNSON, and GLEN GEISENDORFER Aug. 1988 156 p

(Contract NAG2-346)

(NASA-CR-177501; NAS 1.26:177501) Avail: NTIS HC A08/MF A01 CSCL 05I

A theoretical model for evaluating human spatial habitability (HuSH) in the proposed U.S. Space Station is developed. Optimizing the fitness of the space station environment for human occupancy will help reduce environmental stress due to long-term isolation and confinement in its small habitable volume. The development of tools that operationalize the behavioral bases of spatial volume for visual kinesthetic, and social logic considerations is suggested.

This report further calls for systematic scientific investigations of how much real and how much perceived volume people need in order to function normally and with minimal stress in space-based settings. The theoretical model presented in this report can be applied to any size or shape interior, at any scale of consideration, for the Space Station as a whole to an individual enclosure or work station. Using as a point of departure the Isovist model developed by Dr. Michael Benedikt of the U. of Texas, the report suggests that spatial habitability can become as amenable to careful assessment as engineering and life support concerns.
Author

N89-15531*# California Univ., Irvine. Program in Social Ecology.
HUMAN ADAPTATION TO ISOLATED AND CONFINED ENVIRONMENTS: PRELIMINARY FINDINGS OF A SEVEN MONTH ANTARCTIC WINTER-OVER HUMAN FACTORS STUDY
GARY W. EVANS, DANIEL STOKOLS, and SYBIL CARRERE Aug. 1988 143 p
(Contract NAG2-387)
(NASA-CR-177499; NAS 1.26:177499) Avail: NTIS HC A07/MF A01 CSCL 05I

This field study was conducted during the seven-month period of the 1985 austral winter-over at Palmer Station in the Antarctic. The purpose of the study was to understand temporal patterns in physiological arousal and psychological mood over the course of the mission. The investigators were principally interested in how people adapted over time to chronic and acute stressors, and how people use and modify their built environment. Physiological and psychological data were collected several times a week, and information on behavior and the use of physical facilities was collected monthly. Physiological and psychological data were compared with social changes in the setting toward the development of a sequential model of human-environment transactional relationships. Based on the study results, guidelines for design of future isolated and confined environments (ICEs) included: plan space for items which make people feel at home, provide materials to allow people to personalize their environment, allow for flexible environments, provide areas for visual and auditory privacy, equip areas for socializing and remove them from private areas, and provide facilities for exercise and for projects involving physical activity. The study offers guidelines about patterns of adaption that could be expected in an ICE, discusses how these settings can be programmed to facilitate successful adjustment, and provides information about how to design future ICE habitats to maximize a healthy living environment. Author

N89-15532*# Washington Univ., Seattle. Dept. of Psychology.
THE HUMAN FACTORS OF COLOR IN ENVIRONMENTAL DESIGN: A CRITICAL REVIEW
LEE ROY BEACH, BARBARA K. WISE, and JAMES A. WISE Aug. 1988 138 p
(Contract NCC2-404)
(NASA-CR-177498; NAS 1.26:177498) Avail: NTIS HC A07/MF A01 CSCL 05I

The literature on environmental color to enhance habitability in the design of Space Station interiors is reviewed. Some 200 studies were examined to determine the relative contributions of the three dimensions of color (hue, saturation, and brightness or lightness) to responses to environmental colorations. Implications of the study for color usage in novel settings and locales include: (1) There are no hard-wired linkages between environmental colors and particular judgmental or emotional states; (2) Perceptual impressions of color applications can, however, affect experiences and performances in settings; (3) Color behavior studies cannot yet specify an optimal color scheme, but instead must consider differing objectives, the relative importance of each, and design features such as the coordination of geometry, color, texture, etc.; (4) Some color-behavior effects are governed by low-level retinal and limbal mechanisms as well as by cognitive processes; and (5) Colors should first be specified in terms of what they are to do instead of what they are. Some exercise of choice is therefore needed to establish a sense of personal competence in the setting, since color must be ultimately be accepted by the people who are to live with it. Author

N89-15533# FMC Corp., Santa Clara, CA.
DYNAMIC INSTRUCTIONAL PLANNING IN THE BB1 BLACKBOARD ARCHTECTURE
WILLIAM R. MURRAY Aug. 1988 20 p
(Contract N00014-86-C-0487)
(AD-A199132; FMC-R-6168) Avail: NTIS HC A03/MF A01 CSCL 12E

An intelligent tutoring system that delivers effective instruction must select pedagogical actions appropriate to its tutorial situation. The approach taken in this research is to view this control problem as a dynamic planning problem. Dynamic instructional planning is the ability to generate, monitor, and revise instructional plans during the course of instruction. Planning and execution of instructional actions must be interleaved because the tutor operates in a changing environment with incomplete information. An appropriate architecture is the BB1 Blackboard Architecture, which supports the building of knowledge-based planners that represent and reason about their own actions. Dynamic instructional planning uses these capabilities to apply pedagogial knowledge to reason about instructional actions that a tutor can perform. We have built the Blackboard Instructional Planner in BB1 to teach troubleshooting a complex physical device by first imparting a mental model of the device and its operation. The planner generates instructional plans from skeletal plans, executes them, and monitors their effectiveness. Instructional plans are modified and particular instructional actions selected in response to changes in the student model, changes in resources available, requests and questions of the student, and to properties of the subject matter currently being presented. GRA

N89-15534*# California Univ., Irvine. Program in Social Ecology.
HUMAN ADAPTATION TO ISOLATED AND CONFINED ENVIRONMENTS: PRELIMINARY FINDINGS OF A SEVEN MONTH ANTARCTIC WINTER-OVER HUMAN FACTORS STUDY Final Technical Report
GARY W. EVANS, DANIEL STOKOLS, and SYBIL CARRERE Aug. 1987 141 p
(Contract NAG2-387; NSF DPP-85-40817)
(NASA-CR-184664; NAS 1.26:184664) Avail: NTIS HC A07/MF A01 CSCL 05I

The study was conducted over a seven month period in a winter Antarctic isolated and confined environment (ICE). Physiological and psychological data were collected several times a week over the course of the winter. Information was collected on a monthly basis on behavior and the use of physical facilities. Adaptation information indicates that there was a significant decrease in epinephrine and norepinephrine during the middle trimeter of the winter. No significant changes were found for blood pressure over the seven months. Self reports of hostility and anxiety show a linear increase over winter. The physiological and psychological data do not move in a synchronous fashion over time. Behavioral adjustment information highlight the importance of developing schedules which balance work and recreational activities. Anxiety levels increased with the percentage of work hours reported. The increase in work towards the end of the winter underscores the need to pace work loads throughout the ICE tenure. Those individuals who reported the greatest variety of personal activities were the least depressed, hostile, and anxious of the crew. The data on the use and modification of the built environment provide guidelines for the design of future ICEs.
Author

N89-16263# Federal Aviation Administration, Washington, DC. Office of Aviation Medicine.
PERFORMANCE RECOVERY FOLLOWING STARTLE: A LABORATORY APPROACH TO THE STUDY OF BEHAVIORAL RESPONSE TO SUDDEN AIRCRAFT EMERGENCIES
RICHARD I. THACKRAY Aug. 1988 15 p

(Contract FAA-AM-C-69-PSY-21; FAA-AM-C-82/83-PSY-106; FAA-AM-C-88-HRR-111)
(AD-A199827; DOT/FAA/AM-88/4) Avail: NTIS HC A03/MF A01 CSCL 05H

This paper deals with the use of response/recovery rate to auditory startle as a laboratory technique for simulating some of the principal aspects of the initial shock phase of sudden emergency situations. It is submitted that auditory startle, with its unexpectedness, pronounced autonomic reaction, fear-like subjective experience, and frequent behavioral disruption, approximates the response pattern to be expected in the initial shock phase of sudden traumatic emergencies, and that by studying the time course of performance recovery following startle, as well as individual differences in response/recovery rate, we may gain a better understanding of some of the variables related to extreme reactions displayed by individuals in real-life emergency situations. Research studies conducted in our laboratory and in others on performance impairment/recovery following startle are reviewed. These studies include those dealing with initial reaction time to the startle stimulus itself, disruption and recovery rate of perceptual-motor (tracking) performance following startle, and the time-course of performance recovery in information processing tasks after exposure to startle. Data are also presented showing a relationship of several individual difference variables to performance response/recovery following startle. GRA

N89-16264# Army Research Inst. of Environmental Medicine, Natick, MA.
FIELD-DEPENDENCE, JUDGMENT OF WEIGHTS BY FEMALES AND AN APPEAL FOR A MORE COMPLEX APPROACH TO THE STUDY OF INDIVIDUAL DIFFERENCES
BERNARD J. FINE 29 Jul. 1988 30 p
(AD-A199200; USARIEM-M-66-88) Avail: NTIS HC A03/MF A01 CSCL 05H

Fine (1972a) has presented evidence of a strong, nonlinear relationship between field-dependence-independence intro-version-extraversion. In the context of that relationship, he suggested that differences between individuals in field dependence might be conceptualized profitably as at least partially genetically based differences in sensitivity, as contrasted with strength of the nervous system. Differences in sensitivity were assumed to depend upon the extent to which the nervous system becomes differentiated as an individual develops. Differentiation differed from the use of the term by Witkin et al. (1962) in that it was considered in its biological sense as being referrable to physical characteristics of components of the nervous system or of the nervous system as a whole, e.g., size, number and/or distribution of specific types of receptors, elaborateness or complexity of neural networks, quality or quantity of neural transmitter substances, with these ultimately reducible to differences in the molecular structure of enzymes and proteins. GRA

N89-16265# Army Research Inst. of Environmental Medicine, Natick, MA.
INFLUENCE OF ATTITUDE AND EXPECTATION ON MOODS AND SYMPTOMS DURING COLD WEATHER MILITARY TRAINING
RICHARD F. JOHNSON, LAURENCE G. BRANCH, and DONNA J. MCMENEMY 30 Jun. 1988 29 p
(AD-A199201; USARIEM-M-63-88) Avail: NTIS HC A03/MF A01 CSCL 06J

The present study examined the influence of: (1) air temperature, (2) day into training, (3) self rating of life stress, (4) rating of relative warmth in cold weather, and (5) expectation for liking cold weather training, on 59 soldiers' self-reports of illness and mood during 3 days of training in the cold (-18 to 0 C range). Mood was assessed on six domains of the Profile of Mood States rating scale, and symptoms of illness were assessed on 14 domains of the Environmental Symptoms Questionnaire. Multiple regression analyses showed that: (1) the more soldiers expected to dislike the cold weather training, the more tense, depressed, angry, fatigued, and physically uncomfortable they were during training; (2) the more stress they perceived in their everyday lives, the more fatigued, confused, and physically uncomfortable they were during training; (3) as days into training increased the more fatigued they became; and (4) due to appropriate clothing and training, ambient temperature was found to have little influence on the soldiers' moods and symptoms. GRA

N89-16266# Colorado Univ., Boulder.
BEHAVIORAL CONSEQUENCES OF NEUROTRANSMITTER REGULATION Final Report, 15 Sep. 1985 - 14 Sep. 1988
JEANNE M. WEHNER 1 Sep. 1988 11 p
(Contract AF-AFOSR-0369-85; AF PROJ. 2312)
(AD-A200374; AFOSR-88-1092TR) Avail: NTIS HC A03/MF A01 CSCL 06D

Spatial learning ability using the Morris water task was assessed in inbred strains of mice. After initial characterization, two strains were selected to perform studies, C57BL mice which performed the task well, and DBA2/J mice which were impaired in their performance. A comparison of cholinergic markers indicated a significant difference between these two strains in acetyl-cholinesterase activity and in hippocampal protein kinase activity. The difference in protein kinase activity appears to relate to their differing learning ability because a significant correlation between learning ability and hippocampal protein kinase C activity was observed in recombinant inbred strains generated from a cross of C57BL and DBA/2J mice. Additional pharmacological studies were performed in which cholinergic receptors were manipulated by either chronic treatment with an anticholinesterase or an agonist. Such treatments produced a decrease in muscarinic receptors and an impairment in acquisition of spatial learning. These studies demonstrate that cholinergic systems are important during initial acquisition of spatial learning and that coupling of receptors via activation of protein kinase C activity may be an important determinant of learning ability. GRA

N89-16267# Naval Aerospace Medical Research Lab., Pensacola, FL.
A REVIEW OF PERSONALITY MEASUREMENT IN AIRCREW SELECTION Report, for 1987 - 1988
D. L. DOLGIN and G. D. GIBB Jul. 1988 42 p
(AD-A200392; NAMRL-MONOGRAPH-36) Avail: NTIS HC A03/MF A01 CSCL 05I

A comprehensive review of personality literature as it relates to aircrew selection was conducted. The purpose of the study was to identify tests that warrant further research as potential prediction instruments. The advent of performance-based personality assessment and implications for future test development were examined. The majority of personality tests reviewed were invalid for pilot selection. Several tests appear to be both effective in pilot selection and psychometrically sound, and we recommend continued research of those. These recommended selection tests include the Defense Mechanism Test, the Personality Research Form, and the Strong Vocational Interest Blank. GRA

N89-16268# Naval Aerospace Medical Research Lab., Pensacola, FL.
THE RELATIONSHIP BETWEEN FLIGHT TRAINING PERFORMANCE, A RISK ASSESSMENT TEST, AND THE JENKINS ACTIVITY SURVEY Interim Report, Aug. 1986 - Aug. 1987
R. N. SHULL, D. L. DOLGIN, and G. D. GIBB Jul. 1988 12 p
(AD-A200395; NAMRL-1339) Avail: NTIS HC A03/MF A01 CSCL 05I

Current aircrew selection research at the Naval Aerospace Medical Research Laboratory has focused primarily on psychomotor and cognitive abilities. Evidence from studies on flight training attrition suggests that a number of failures may be attributed to personality or motivational factors rather than a lack of abilities. Because flight training success is a dynamic interaction of abilities, motivation, and personality factors, all three areas should be included to optimize the predictive validity of aircrew selection batteries. Two sets of data are presented; one set is from a computer based risk assessment task, and the other is from the Jenkins Activity Survey. The data indicated few relationships

between risk assessment measures and flight training criteria. We found only one indication that increased risk taking was associated with successfully completing primary flight training. The Jenkins Activity Survey results indicated contradictory relationships between the scale measures and flight training criteria in the few significant findings observed. GRA

N89-16269# Human Engineering Labs., Aberdeen Proving Ground, MD.
AN ANNOTATED BIBLIOGRAPHY ON OPERATOR MENTAL WORKLOAD ASSESSMENT Final Report
JOHN K. SCHMIDT and HELEN M. NICEWONGER Aug. 1988 104 p
(AD-A200498; HEL-TN-7-88) Avail: NTIS HC A06/MF A01 CSCL 05H

An annotated bibliography on operator mental workload assessment is provided with corresponding documentation to enhance its utility as a reference. The present work is to be viewed as an extension to and not a replacement for an earlier effort by Wierwille and Williges (1980), An Annotated Bibliography on Operator Mental Workload Assessment. For the most part, references published between the years 1980 and 1986 are included. Each of the 206 citations presented from the literature contain reference information as well as an abstract. All listings are indexed by both author and subject. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A89-21177* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NASA RESEARCH AND DEVELOPMENT FOR SPACE TELEROBOTICS
PAUL S. SCHENKER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) (California Institute of Technology, Workshop on Space Telerobotics, Pasadena, Jan. 1987) IEEE Transactions on Aerospace and Electronic Systems (ISSN 0018-9251), vol. 24, Sept. 1988, p. 523-534. refs

The goal of this research is to explore and prove out robust concepts for telerobotic support of space servicing, assembly, maintenance, and telescience tasks. This goal is being addressed through a program of coordinated work in artificial intelligence, robotics, and human factors. The general research objective is the fusion of robot sensing and manipulation, teleoperation, and human and machine cognitive skills into an effective architecture for supervised task automation. NASA is evaluating results of this research program in a ground laboratory telerobot testbed under development at JPL. The testbed development activity includes integrated technology demonstrations. The demonstrations will show telerobot capabilities to perform tasks of increasing complexity, and duration in increasingly unstructured environments. The first such demonstration is the ground-based grappling, dockling, and servicing of a satellite taskboard. I.E.

A89-21178
HIERARCHICAL CONTROL OF INTELLIGENT MACHINES APPLIED TO SPACE STATION TELEROBOTS
J. S. ALBUS, R. LUMIA, and H. MCCAIN (NBS, Gaithersburg, MD) (California Institute of Technology, Workshop on Space Telerobotics, Pasadena, Jan. 1987) IEEE Transactions on Aerospace and Electronic Systems (ISSN 0018-9251), vol. 24, Sept. 1988, p. 535-541. refs

A hierarchical architecture is described which supports space station telerobots in a variety of modes. The system is divided into three hierarchies: task decomposition, world model, and sensory processing. Goals at each level of the task decomposition hierarchy are divided both spatially and temporarily into simpler commands for the next lower level. This decomposition is repeated until, at the lowest level, the drive signals to the robot actuators are generated. To accomplish its goals, task decomposition modules must often use information stored in the world model. The purpose of the sensory system is to update the world model as rapidly as possible to keep the model in registration with the physical world. The architecture of the entire control system hierarchy and how it can be applied to space telerobot applications are discussed. I.E.

A89-21179* California Univ., Berkeley.
TELEROBOTICS - PROBLEMS AND RESEARCH NEEDS
LAWRENCE STARK, FRANK TENDICK, WON SOO KIM, RUSSELL ANDERSON, MICHAEL HISEY (California, University, Berkeley) et al. (California Institute of Technology, Workshop on Space Telerobotics, Pasadena, Jan. 1987) IEEE Transactions on Aerospace and Electronic Systems (ISSN 0018-9251), vol. 24, Sept. 1988, p. 542-551. Research supported by NASA. refs

With major emphasis on simulation, a university laboratory telerobotics facility permits problems to be approached by groups of graduate students. Helmet-mounded displays provide realism; the slaving of the display to the human operator's viewpoint gives a sense of 'telepresence' that may be useful for prolonged tasks. Using top-down three-dimensional model control of distant images allows distant images to be reduced to a few parameters to update the model used for display to the human operator in a preview mode to circumvent, in part, the communication delay. Also, the model can be used as a format for supervisory control and permit short-term local autonomous operations. Image processing algorithms can be made simpler and faster without trying to construct sensible images from the bottom. Control studies of telerobots lead to preferential manual control modes and basic paradigms for human motion and thence, perhaps, to redesign of robotic control, trajectory path planning, and rehabilitation prosthetics. I.E.

A89-21184
ISSUES IN HUMAN/COMPUTER CONTROL OF DEXTEROUS REMOTE HANDS
KENNETH SALISBURY (MIT, Cambridge, MA) (California Institute of Technology, Workshop on Space Telerobotics, Pasadena, Jan. 1987) IEEE Transactions on Aerospace and Electronic Systems (ISSN 0018-9251), vol. 24, Sept. 1988, p. 591-596. Research supported by the Systems Development Foundation. refs

Much research on dexterous robot hands has been aimed at the design and control problem associated with their autonomous operation, while relatively little research has addressed the problem of direct human control. While many of the issues in mixed computer/human control of dexterous hands parallel those found in supervisory control of traditional remote manipulators, the unique geometry and capabilities of dexterous hands pose many new problems. Among these are the control of redundant degrees of freedom, grasp stabilization and specification of nonanthromorphic behavior. An overview is presented of progress made at the MIT AI Laboratory in control of the Salisbury three-finger hand, including experiments in grasp planning and manipulation by controlled slip. It is suggested that it might be possible to introduce human control into the process at a variety of functional levels. I.E.

A89-21403
EVA SAFETY [SECURITE DES ACTIVITES SPATIALES EXTRA-VEHICULAIRES]
J. LALOE (Avions Marcel Dassault-Breguet Aviation, Saint-Cloud, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 132, 1988, p. 23-30. In French.

The applications, risks, and safety objectives of EVA are discussed. Goals of EVA safety include protecting the astronaut from external hazards such as radiation and debris, controlling the internal space-suit environment, and assuring the physical and psychological health of the astronaut. Other factors considered include the mobility and dexterity of digits and limbs, EVA

locomotion, the mother-vessel/space-suit interface, and EVA procedures such as prebreathing prior to partial depressurization and airlock tests. R.R.

A89-22431* Mitre Corp., Bedford, MA.
A USER INTERFACE FOR A KNOWLEDGE-BASED PLANNING AND SCHEDULING SYSTEM
ALICE M. MULVEHILL (Mitre Corp., Bedford, MA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, July-Aug. 1988, p. 514-521. Research supported by NASA. refs

The objective of EMPRESS (Expert Mission Planning and Replanning Scheduling System) is to support the planning and scheduling required to prepare science and application payloads for flight aboard the US Space Shuttle. EMPRESS was designed and implemented in Zetalisp on a 3600 series Symbolics Lisp machine. Initially, EMPRESS was built as a concept demonstration system. The system has since been modified and expanded to ensure that the data have integrity. Issues underlying the design and development of the EMPRESS-I interface, results from a system usability assessment, and consequent modifications are described. I.E.

A89-22432* Georgia Inst. of Tech., Atlanta.
OFMSPERT - INFERENCE OF OPERATOR INTENTIONS IN SUPERVISORY CONTROL USING A BLACKBOARD ARCHITECTURE
PATRICIA S. JONES, CHRISTINE M. MITCHELL (Georgia Institute of Technology, Atlanta), and KENNETH S. RUBIN (Advanced Decisions Systems, Mountain View, CA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, July-Aug. 1988, p. 618-637. refs
(Contract NAS5-57535; NAG2-413)

The authors proposes an architecture for an expert system that can function as an operator's associate in the supervisory control of a complex dynamic system. Called OFMspert (operator function model (OFM) expert system), the architecture uses the operator function modeling methodology as the basis for the design. The authors put emphasis on the understanding capabilities, i.e., the intent referencing property, of an operator's associate. The authors define the generic structure of OFMspert, particularly those features that support intent inferencing. They also describe the implementation and validation of OFMspert in GT-MSOCC (Georgia Tech-Multisatellite Operations Control Center), a laboratory domain designed to support research in human-computer interaction and decision aiding in complex, dynamic systems. I.E.

A89-22433* University of Southern California, Los Angeles.
MENTAL WORKLOAD DYNAMICS IN ADAPTIVE INTERFACE DESIGN
PETER A. HANCOCK and MARK H. CHIGNELL (Southern California, University, Los Angeles, CA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, July-Aug. 1988, p. 647-658. refs
(Contract NCC2-379)

In examining the role of time in mental workload, the authors present a different perspective from which to view the problem of assessment. Mental workload is plotted in three dimensions, whose axes represent effective time for action, perceived distance from desired goal state, level of effort required to achieve the time-constrained goal. This representation allows the generation of isodynamic workload contours that incorporate the factors of operator skill and equifinality of effort. An adaptive interface for dynamic task reallocation is described that uses this form of assessment to reconcile the joint aims of stable operator loading and acceptable primary task performance by the total system. I.E.

A89-22434* Search Technology, Inc., Norcross, GA.
DEEP-REASONING FAULT DIAGNOSIS - AN AID AND A MODEL
WAN CHUL YOON (Korea Institute of Technology, Taejon, Republic of Korea) and JOHN M. HAMMER (Search Technology, Inc., Norcross, GA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, July-Aug. 1988, p. 659-676. refs
(Contract NAG2-123)

The design and evaluation are presented for the knowledge-based assistance of a human operator who must diagnose a novel fault in a dynamic, physical system. A computer aid based on a qualitative model of the system was built to help the operators overcome some of their cognitive limitations. This aid differs from most expert systems in that it operates at several levels of interaction that are believed to be more suitable for deep reasoning. Four aiding approaches, each of which provided unique information to the operator, were evaluated. The aiding features were designed to help the human's casual reasoning about the system in predicting normal system behavior (N aiding), integrating observations into actual system behavior (O aiding), finding discrepancies between the two (O-N aiding), or finding discrepancies between observed behavior and hypothetical behavior (O-HN aiding). Human diagnostic performance was found to improve by almost a factor of two with O aiding and O-N aiding. I.E.

A89-23336#
THE COCKPIT MOCK-UP (CMU) - A COCKPIT AND CREW STATION DESIGN TOOL
M. STARKE (ESG Elektronik-System GmbH, Munich, Federal Republic of Germany) AAAF, European Rotorcraft Forum, 13th, Arles, France, Sept. 8-11, 1987, Paper. 14 p.

A description is given of the CMU, which is a full-scale model of a cockpit for a future light transport helicopter with the flight-mode and flight-phase dependent presentation of information on multifunction displays (MFDs) and a centralized control system. The CMU, due to its display and control system and simulation models, allows operations in real time when test personnel are part of the closed-loop process. Results obtained in tests with operational aircrews, test pilots and flying instructors are discussed. K.K.

A89-24170
STOCHASTIC MODELING OF HUMAN-PERFORMANCE RELIABILITY
KANG W. LEE (Electronics and Telecommunications Research Institute, Dae Dog Science Town, Republic of Korea), JAMES J. HIGGINS, and FRANK A. TILLMAN (Kansas State University, Manhattan) IEEE Transactions on Reliability (ISSN 0018-9529), vol. 37, Dec. 1988, p. 501-504. refs

A stochastic model is developed to quantify the reliability of human performance. The model provides closed-form mathematical expressions into which multiple factors affecting the reliability of man-machine systems can be incorporated. Three elements of man-machine systems are combined to form the framework for modeling: random task arrivals, transient human performance characteristics (detection of task arrivals, performance accuracy, performance time, etc.), and operational requirements of the system. Simulation and numerical models that could be developed within this framework are indicated. I.E.

A89-24198
THE PROBLEMS OF STRENGTH IN BIOMECHANICS [PROBLEMY PROCHNOSTI V BIOMEKHANIKE]
IVAN FILIPPOVICH OBRAZTSOV, INNA SEMENOVNA ADAMOVICH, ARNOL'D SEMENOVICH BARER, I. V. KNETS, IU. G. KONAKHEVICH et al. Moscow, Izdatel'stvo Vysshaia Shkola, 1988, 312 p. In Russian. refs

This book considers the human body as a biomechanical system, together with the mechanical characteristics of the body-supporting systems, such as musculature, bones, and cartilage. Attention is also given to the structure and the mechanical characteristics of the body-supporting systems and the elements of the cardiovascular system when these systems are under mechanical stress of various types (such as long-term static loads, continuously changing ambient pressure, percussion, and vibrations) and to the defense mechanisms of these tissues and

systems against mechanical stress. Finally, the problems of mechanical strength related to artificial orthopedic constructions are discussed, and physical and mathematical models for investigating the strength of the human body under various physical loads are described. I.S.

A89-24848
SELF-MONITORING OF SUBJECTIVE STATUS DURING EXTENDED OPERATIONS USING AN AUTOMATED PERFORMANCE TEST BATTERY
ROBERT S. KENNEDY and LOIS-ANN KUNTZ (Essex Corp., Orlando, FL) IN: Space safety and rescue 1986-1987. San Diego, CA, Univelt, Inc., 1988, p. 91-97. refs
(IAF PAPER 86-415)

The lack of a functional performance battery to assess human performance in toxic environments is discussed. Progress in the research and development of such a battery is discussed. Data have been collected for four years on an automated performance test system which comprises a menu of tests with excellent metric properties which are sensitive to various agents and treatments. These findings are reviewed. Author

N89-15535*# Life Systems, Inc., Cleveland, OH.
ALKALINE STATIC FEED ELECTROLYZER BASED OXYGEN GENERATION SYSTEM Final Report
L. D. NOBLE, A. J. KOVACH, F. A. FORTUNATO, F. H. SCHUBERT, and D. J. GRIGGER Oct. 1988 93 p
(Contract NAS9-17602)
(NASA-CR-172093; NAS 1.26:172093; TR-925-96) Avail: NTIS HC A05/MF A01 CSCL 06K

In preparation for the future deployment of the Space Station, an R and D program was established to demonstrate integrated operation of an alkaline Water Electrolysis System and a fuel cell as an energy storage device. The program's scope was revised when the Space Station Control Board changed the energy storage baseline for the Space Station. The new scope was aimed at the development of an alkaline Static Feed Electrolyzer for use in an Environmental Control/Life Support System as an oxygen generation system. As a result, the program was divided into two phases. The phase 1 effort was directed at the development of the Static Feed Electrolyzer for application in a Regenerative Fuel Cell System. During this phase, the program emphasized incorporation of the Regenerative Fuel Cell System design requirements into the Static Feed Electrolyzer electrochemical module design and the mechanical components design. The mechanical components included a Pressure Control Assembly, a Water Supply Assembly and a Thermal Control Assembly. These designs were completed through manufacturing drawing during Phase 1. The Phase 2 effort was directed at advancing the Alkaline Static Feed Electrolyzer database for an oxygen generation system. This development was aimed at extending the Static Feed Electrolyzer database in areas which may be encountered from initial fabrication through transportation, storage, launch and eventual Space Station startup. During this Phase, the Program emphasized three major areas: materials evaluation, electrochemical module scaling and performance repeatability and Static Feed Electrolyzer operational definition and characterization. Author

N89-15536# Anacapa Sciences, Inc., Fort Rucker, AL.
HUMAN FACTORS RESEARCH IN AIRCREW PERFORMANCE AND TRAINING Annual Summary Report, Feb. 1986 - Oct. 1987
THEODORE B. ALDRICH and MICHAEL MCANULTY Aug. 1988 128 p
(Contract MDA903-87-C-0523)
(AD-A199906; ASI-690-304-87; ARI-RN-88-84) Avail: NTIS HC A07/MF A01 CSCL 23B

This research note presents summary descriptions of research projects performed for ARI at Fort Rucker, Alabama. During the period 18 February 1986 through 8 October 1987, contractor personnel worked on 17 research projects in the areas of emerging system design, manpower and personnel, aviation simulation, and aviator training. The summary description for each project contains a background section that describes the rationale for the project, and specifies the research objectives, a research approach section that describes the tasks and activities required to meet the project objectives, a results section describing the research findings (or, in the case of developmental activities, the research products), and, finally, a project status section that describes the work completed and projections for future research, if any. GRA

N89-15537# Navy Clothing and Textile Research Facility, Natick, MA.
THE ALUMINIZED PROXIMITY CRASH-RESCUE COAT/TROUSER ENSEMBLE: A TECHNICAL EVALUATION Final Report, Oct. 1985 - Oct. 1987
M. W. PINE Jun. 1988 23 p
(AD-A199973; NCTRF-168) Avail: NTIS HC A03/MF A01 CSCL 15E

The Navy Clothing and Textile Research Facility (NCTRF) developed a lightweight, knitted, aluminized Kevlar fabric for fabrication of new fire proximity crash-rescue suits, which provided greater flexibility and comfort to the firefighter in performing his or her duties. The standard suit, fabricated of 100 percent woven Kevlar, was heavier, stiffer, and much more difficult to move in than the new proximity suit. The new aluminized proximity Kevlar knit crash-rescue (APCR) coat/trouser ensemble then underwent a technical evaluation to show compliance with several development test and evaluation (DT and E) threshold parameters, including flammability, burn injury, and radiant heat penetration. The DT and E results demonstrated that the new APCR ensemble consistently met or exceeded the results development test thresholds. GRA

N89-15538# Allen Corp. of America, Alexandria, VA.
DEVELOPMENT OF LHX (LIGHT HELICOPTER FAMILY) MANPRINT (MANPOWER AND PERSONNEL INTEGRATION) ISSUES Final Report, Mar. - Dec. 1986
ROBERT E. JONES, JR., ROBERT C. TREXLER, JACOB L. BARBER, and JERRY L. GUTHRIE Sep. 1988 178 p
(AD-A199530; ARI-RN-88-88) Avail: NTIS HC A09/MF A01 CSCL 01C

This research note documents one stage in the incorporation of Manpower and Personnel Integration (MANPRINT) into the early stages of the acquisition of a major weapon system. It describes a process of identifying and analyzing the human factors, health hazard, and training issues associated with the Light Helicopter Family (LHX). The RN also describes the LHX MANPRINT Data Base Management System -- an automated data base whose structure and operation should be generally useful in any acquisition of material. GRA

N89-15539# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
CONSIDERATIONS CONCERNING THE ASSESSMENT OF PILOT WORKLOAD FOR COMPLEX TASK CONDITIONS
R. C. VANDEGRAAF 25 Sep. 1987 19 p Presented at the AGARD Joint GCP/FMP Symposium on the Man-Machine Concept in Tactical Design and Combat Automation, Stuttgart, Fed. Republic of Germany, 28 Sep. - 2 Oct. 1987
(Contract NIVR-01406-N)
(NLR-MP-87069-U; ETN-89-93886) Avail: NTIS HC A03/MF A01

The problem of being able to draw conclusions from a variety (i.e., a matrix) of experimental measures in a complex task situation is discussed. Dealing with contradictory outcomes, the designating of artefacts, and formulating final conclusions without the (a-priori) availability of a superior method for evaluating other methods were examined in an in-flight study concerning the assessment of pilot workload under various instrument approach conditions for a fixed-wing (civil) transport aircraft. The experimental findings were compared with the results of an in-flight experiment dealing with pilot workload and performance during helicopter (instrument-flying) tasks. Subjective ratings, physiological measurements, and task performance measurements are assessed. A strategy for the

formulation of final conclusions based on the outcomes of a matrix of measures is suggested. ESA

N89-16270# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.
TARGET ACQUISITION AND ANALYSIS TRAINING SYSTEM: AN EXPLORATORY INVESTIGATION OF VEHICLE IDENTIFICATION PERFORMANCE WITH BLACK HOT AND WHITE HOT THERMAL IMAGES Interim Report, Jun. - Jul. 1984
OTTO H. HEUCKEROTH, NORMAN D. SMITH, and WILLIAM L. WARNICK May 1988 26 p
(AD-A195725; ARI-RN-88-34) Avail: NTIS HC A03/MF A01 CSCL 19E

This research note reports on research whose major objectives to determine: (1) how overall identification performance differs between slides of black hot and white thermal vehicle images, and (2) how identification performance is affected by whether the images shown at various ranges are black hot or white hot. The primary conclusions drawn from the data analyses included these: The black hot thermal polarity setting is preferred for target identification by the majority of soldiers who are competent in vehicle recognition and identification using thermal sights. Although an average of absolute differences between performance using black hot and white hot images favored the use of black hot images across all ranges, these results are inconclusive. Further research is suggested. Identification performance using thermal images degrades sharply at intermediate (1300 to 1700 meter) and far (1800 to 2300 meter) ranges. GRA

N89-16271# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
***AREA CODING TECHNIQUES FOR MONOCHROMATIC* VISUAL DISPLAYS Final Technical Report, Jul. 1985 - Dec. 1987**
S. MUKHERJEE and J. GREENSTEIN Jan. 1988 78 p Prepared in cooperation with Clemson Univ., SC
(Contract N66001-85-C-0254; DA PROJ. F57-525)
(AD-A198632; NOSC/TD-1223) Avail: NTIS HC A05/MF A01 CSCL 12I

A study was conducted to investigate the best coding scheme for differentiating among six different area types on a monochromatic visual display. Three independent variables, coding technique, display background, and foreground line thickness were studied in a 3 x 2 x 2 factorial, within-subjects design. Coding technique was studied at 3 levels. Coding technique 1 employed six patterns in one shade of gray, coding technique 2 employed three patterns in each of two shades of gray, and coding technique 3 employed two patterns in each of three shades of gray. Display background was tested at two levels, black and white. Foreground line thickness was also tested at two levels, single pixel thickness and double pixel thickness. Three dependent measures were studied target memorization time, search time, and percentage selection error. There proved to be no significant difference between coding techniques 1 and 2 at any combination of display background and foreground line thickness for either search time or percentage selection error. Coding technique 3 produced significantly poorer results both for search time and percentage selection error. Target memorization time was lower with coding techniques 1 and 2, and also with double pixel foreground thickness. Subjects preferred coding technique 1 with any combination of display background and line thickness and coding technique 2 with black display background and double pixel foreground line thickness. GRA

N89-16272# Naval Ocean Research and Development Activity, Bay St. Louis, MS. Oceanography Div.
SUPPORT FOR AN ARCTIC CAMP FOR 10 PERSONS FOR 30 DAYS Final Report
J. P. WELSH and R. E. BURGE Jul. 1988 22 p
(AD-A199296; NORDA-TN-347) Avail: NTIS HC A03/MF A01 CSCL 15E

Equipments, tasks, and training necessary for deployment of a camp on sea ice to support 10 persons for 30 days are described. Topics discussed include transportation, shelter, heat, food, fuel, electrical power, communications, packing, handling, personnel training, and basic health considerations. GRA

N89-16273*# *Massachusetts Inst. of Tech., Cambridge. Dept.* of Chemical Engineering.
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS Final Report
M. KAREL and Z. NAKHOST 25 Jan. 1989 6 p
(Contract NCC2-231)
(NASA-CR-184669; NAS 1.26:184669) Avail: NTIS HC A02/MF A01 CSCL 05H

The potential use of micro-algae in yielding useful macronutrients for the CELSS is investigated. Algal proteins were isolated and characterized from green algae (Scenedesmus obliquus) grown under controlled conditions. The RNA and DNA contents were determined, and methodology for reduction of the nucleic acid content to acceptable levels developed. Lipid extraction procedures using supercritical fluids were tailored to removal of undesirable lipids and pigments. Initial steps toward preparation of model foods for potential use in the CELSS were taken. The goal was to fabricate food products which contain isolated algal macronutrients such as proteins and lipids and also some components derived from higher plants including wheat flour, soy flour, potato powder (flakes), soy oil, and corn syrup. Author

N89-16274*# Texas Univ., Austin. Dept. of Mechanical Engineering.
RADIATION PROTECTIVE STRUCTURE ALTERNATIVES FOR HABITATS OF A LUNAR BASE RESEARCH OUTPOST
FRED J. BELL, LAI T. FOO, and WILLIAM P. MCGREW 1988 68 p
(Contract NGT-21-002-080)
(NASA-CR-184720; NAS 1.26:184720) Avail: NTIS HC A04/MF A01 CSCL 06K

The solar and galactic cosmic radiation levels on the Moon pose a hazard to extended manned lunar missions. Lunar soil represents an available, economical material to be used for radiation shielding. Several alternatives have been suggested to use lunar soil to protect the inhabitants of a lunar base research outpost from radiation. The Universities Space Research Association has requested that a comparative analysis of the alternatives be performed, with the purpose of developing the most advantageous design. Eight alternatives have been analyzed, including an original design which was developed to satisfy the identified design criteria. The original design consists of a cylindrical module and airlock, partially buried in the lunar soil, at a depth sufficient to achieve adequate radiation shielding. The report includes descriptions of the alternatives considered, the method of analysis used, and the final design selected. Author

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A89-23751
COULD SEMICONDUCTORS HAVE PARTICIPATED IN EVOLUTION? [MOGLI LI POLUPROVODNIKI UCHASTVOVAT' V EVOLIUTSII?]
A. A. KRASNOVSKII and V. V. NIKANDROV (AN SSSR, Institut Biokhimii, Moscow, USSR) Priroda (ISSN 0032-874X), Dec. 1988, p. 39-41. In Russian. refs

Experimental studies have shown that inorganic semiconductors (earth-crust components) may have participated in various ways in supplying energy for chemical and biological evolution on the earth. In particular, it is shown that the properties of TiO2, ZnO,

and WO3 semiconductors under the effect of near-UV radiation make these substances suitable for the oxidation of water, leading to the formation of molecular oxygen and the reduction of iron oxides or benzoquinol compounds. The absorption of 100 photons by semiconductor particles leads to the formation of a single oxygen molecule. B.J.

N89-15826*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

A LUNAR BASE FOR SETI (SEARCH FOR EXTRA-TERRESTRIAL INTELLIGENCE)

BERNARD M. OLIVER *In* NASA, Lyndon B. Johnson Space Center, Future Astronomical Observatories on the Moon p 119-123 Mar. 1988

Avail: NTIS HC A07/MF A01 CSCL 06C

The possibilities of using lanar based radio antennas in search of intelligent extraterrestrial communications is explored. The proposed NASA search will have two search modes: (1) An all sky survey covering the frequency range from 1 to 10 GHz; and (2) A high sensitivity targeted search listening for signals from the approx. 800 solar type stars within 80 light years of the Sun, and covering 1 to 3 GHz. Author

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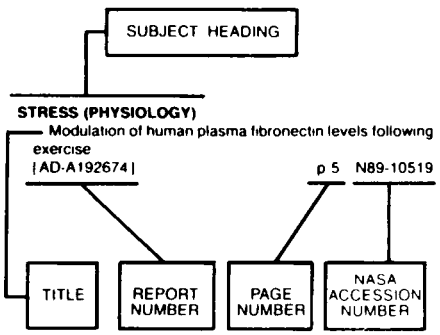

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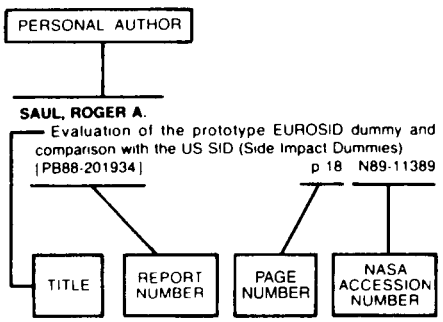

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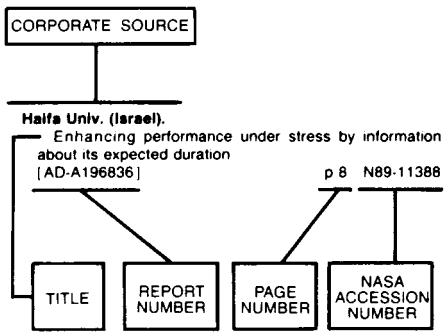

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FOREIGN TECHNOLOGY INDEX

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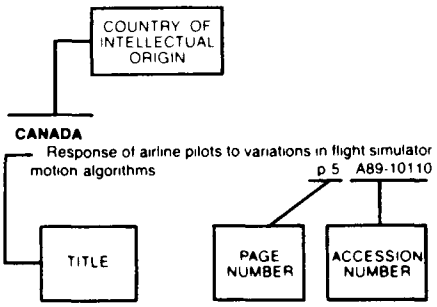

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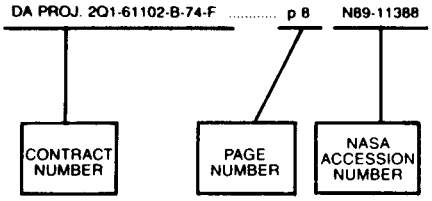

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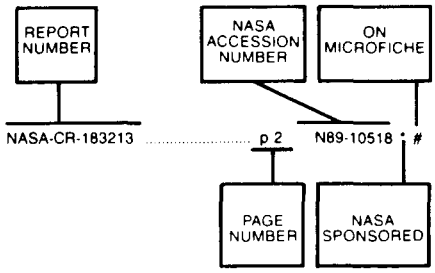

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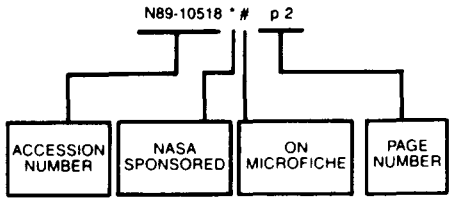

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